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Agricultural Experiment Station

University of Kentucky, Lexington, Ky.

BULLETIN NO. 235

Commercial Feeding Stuffs

BY
J. D. TURNER, H. D. SPEARS
and E. L. JACKSON

MDCCCLXV

SEPTEMBER, 1921

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BULLETIN NO. 235

Commercial Feeding Stuffs

By J. D. Turner, H. D. Spears and E. L. Jackson

Bulletin No. 223 of this Department discust the general characteristics of the various feed products, their combinations and uses and the application of the law in their manufacture and sale, including inspection and analysis. Bulletin 223 may be had upon request. It contains much useful information for feeders of live stock. This bulletin deals only with the inspection and analysis of feedstuffs, principally for the year 1920.

Some Dishonest Methods.

Investigation into the manufacture and sale of feedstuffs for the past year reveals many illegitimate practises. These vary in the manner and degree of fraud perpetrated upon the public. Wherever there is a rising market for a certain class of feeds or a special demand for certain materials, a marked increase in violation of the law is usually observed.

Illegitimate use of Screenings—The illegitimate use of screenings is one of the greatest frauds, perhaps, practist in the feed business. Screenings vary in quality; their value as a feeding material may be considerable or rather small, or they may be worthless or even dangerous on account of the mouldy and rotten grains and the poisonous weed seeds they often carry. Cheap, trashy, low-grade feeds usually contain a large percentage of screenings.

Use of Inferior Grains—A very common fraud is the use of inferior grains in mixed feeds. Grains of an inferior character, containing an admixture of less desirable grains and weed seeds, are too often used as first-class grains. Sometimes the grains are damaged and in a more or less decomposed condition or immature and inferior in quality. Examples of this may be found in mixed feeds where corn is used, the corn being in a damaged and unsound condition; or where oats are used,

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a large part of them being wild and pin-head oats; or in case of barley, the "barley" being a mixture of barley, wild oats and weed seeds; or in case of wheat, the "wheat" being composed of immature, broken and damaged grains. In some instances grain screenings are used in mixed feeds instead of straight grains. the principal grains present being listed as ingredients with the additional statement that screenings are used, to cover up the identity of the material and to be within the law as nearly as possible.

Substitution of Wheat Bran—Another typical example of fraudulent practise is the adulteration of middlings and shorts with wheat bran or its substitution for these materials. In addition to adulteration with ground wheat bran, ground weed seeds are used sometimes under the guise of screenings. The use of bran and weed seeds in this way dates back to war times and is insisted upon by many of the mills of the country as being legitimate. This Department has consistently refused to yield to such claims and has been carrying on a vigorous campaign against the practise since January, 1919.

The practise not only works a fraud upon the purchaser of these products, but it makes useless the experimental data that have been accumulated over a long period on a class of standard feeds, by changing the character and standard of these feeds. As a means toward breaking up this method of adulteration, the department adopted chemical standards and cancelled all registrations of this class of feeds that did not meet these standards and would not accept any new registrations except on the basis of these standards.

Chemical Standards Adopted—The standards promulgated for wheat feeds, either with or without screenings, are: Mixed Wheat Feed—protein not less than 15.50 per cent, fat not less than 3.50 per cent and fiber not more than 8.50 per cent; Wheat Bran—protein not less than 14.50 per cent, fat not less than 3.50 per cent and fiber not more than 10 per cent; Wheat Middlings or Shorts—protein not less than 16 per cent, fat not less than 3.50 per cent and fiber not more than 7.50 per cent; White Wheat Middlings or Shorts—protein not less than 16 per cent, fat not less than 3.50 per cent and fiber not more than 6.50 per cent; White Flour Middlings—protein not less than 16 per cent, fat not less than 3.50 per cent and fiber not more than 4.50 per cent; Red Dog—protein not less than 15 per cent, fat not less than 3.50 per cent and fiber not more than 3.50 per cent. If screenings are used in wheat feeds or any mixed feeds, the percentage and the statement whether ground or unground must be stated in the registration and printed on the official label.

Fraud in the use of Alfalfa—Another typical example of illegal practise is found in the alfalfa meal business and the preparation of alfalfa by some manufacturers to be used in their mixed feeds. Alfalfa hay is ground to a certain degree of fineness and then past over screens: the finer parts that are sifted out are sold and used as "alfalfa leaf meal" and the straw or coarser parts are sold and used as "alfalfa meal."

The so-called alfalfa leaf meal is used in hog and poultry feeds, while the coarser meal is used in horse and dairy feeds. The "alfalfa leaf meal" is composed of the alfalfa leaves, the small stems and the finer parts of the main stems, while the coarser part of the so-called "alfalfa meal" is nothing more than alfalfa stems or straw.

A standard of 32 per cent has been adopted by this Department as the maximum for fiber in alfalfa meal, but as most of the alfalfa used in this State is in the form of mixed feeds, the standard does not assist in regulating the quality of this product except where it is sold as a straight material.

Adulteration with Rice Hulls and Bagasse—The adulteration of feeds with rice hulls and peanut by-product feeds is another practise carried on by some manufacturers. Evidence of adulteration with bagasse (ground sorghum cane stalk) has been found, but very little of these feeds with such adulterant has reached Kentucky.

The tonnage of commercial feeds of all classes consumed in Kentucky during the year 1920, in round numbers, amounted to 250 thousand tons, made up as follows:

Wheat Middlings and Shorts	18,675	tons
Mixed Wheat Feed and Screenings	32,330	“
Wheat Bran and Screenings	15,965	“
Mixed Feeds (Wheat and Corn)	27,120	“
Corn Chop and Cracked Corn	14,650	“
Corn Feed Meal	3,050	“
Hominy Feed	8,175	“
Corn Gluten Feed	375	“
Crushed Corn	750	“
Crushed Corn and Cob	125	“
Chicken Feed	24,935	“
Chicken Mash	2,450	“
Dairy Feed	21,475	“
Horse and Mule Feed	42,920	“
Stock Feed	3,450	“
Chop Feed	625	“
Meat Meal	250	“
Meat Scrap	175	“
Digester Tankage	725	“
Ground Oats	575	“
Ground Barley	1,610	“
Ground Barley and Oats	150	“
Rye Middlings	700	“
Hog Feed	3,350	“
Pig Meal	1,825	“
Calf Meal	225	“
Alfalfa Meal	250	“
Oil Meal	580	“
Cotton Seed Meal 43%	1,470	“
Cotton Seed Meal 41%	7,760	“
Cotton Seed Meal 38.62%	865	“
Cotton Seed Feed 36%	2,485	“
Cotton Seed Feed 20%	50	“
Kaffir Corn Meal	150	“
Peanut Oil Cake Meal	50	“
Brewers' Dried Grains	175	“
Rice Bran	585	“
Velvet Bean Molasses Feed	120	“
Velvet Bean Feed	30	“
Corn and Oat Chop	75	“
Miscellaneous Materials	3,105	“

It is interesting to note what proportion of the feeds consumed in the State is made in the State. Of the total straight wheat feeds consumed, only 40 per cent is made by Kentucky concerns, 33 per cent wheat middlings and shorts, 52 per cent of mixed wheat feeds and 35 per cent wheat bran. In connection with this statement covering the production of wheat feeds in Kentucky, it should be noted that many of the mills have attachments for making corn meal for table use and in most of these mills the corn by-products obtained in the manufacture of this table meal are blended with the wheat feeds and called mixed feeds or mixed wheat and corn feeds. The prevailing ingredient coming from the corn used in this mixture is corn bran and the mixture carries from 2 to 3 per cent to as high as 15 per cent of this product. In some instances, corn hearts and corn screenings are used. Of this class of feed, 79 per cent is produced in Kentucky.

Of the total mixed stock feeds of all classes, consumed in the State, such as dairy, horse and mule, poultry, beef and hog feeds, only 15 per cent is produced by Kentucky concerns and the balance of 85 per cent is shipped into the State by outside concerns. Of the dairy feeds consumed in the State, 22 per cent is produced in Kentucky; of the horse and mule feeds, 13 per cent; of the stock feed, 8 per cent; of the chop feed, none; of the poultry mixed grains, 18 per cent; of the poultry mash, 15 per cent; of the hog feed, 15 per cent.

Of the various other materials, more or less straight materials, 64 per cent of the corn chop and cracked corn consumed in the State is produced by Kentucky concerns; 62 per cent of the corn feed meal; 33 per cent of the hominy meal or feed; none of the corn gluten meal or feed; none of the meat meal and meat scrap; 10 per cent of the digester tankage; 42 per cent of the ground oats; 20 per cent of the ground barley; 75 per cent of the ground barley and oats; 5 per cent of the rye middlings; 10 per cent of the alfalfa meal; none of the kaffir corn meal; all of the brewers' grains; 40 per cent of the corn and oat chop; none of the oil-mill by-products, such as cotton seed meal and feeds, linseed meal, copra meal, velvet bean meal, peanut meal and feeds; and none of the several miscellaneous materials such as palmo midds, oatmeal middlings, red dog flour, kaffir corn dried grains.

Some cheap and poor-grade feeds are made by Kentucky manufacturers but most of the feeds made by Kentucky concerns and consumed in Kentucky are of a reasonably good quality and a very good portion of them of a very high quality. The bulk of the poor feeds and most of the adulterated feeds purchased in this State are made in other states.

For the period covered by this bulletin, 1284 official analyses have been made and are contained herein. Of this total number, 318 are wheat by-products; 161 mixed feed composed of wheat by-products and corn bran; 102 cotton seed meal; 47 cotton seed feed; 64 poultry feed; 36 meat products; 16 oil meal; 291 stock feeds; 117 miscellaneous stock feeds containing a material of little or no feeding value; 14 rye feeds; 49 corn products; 40 ground barley; and 19 miscellaneous by-products.

Wheat Feeds—Of the wheat feeds, 182 are wheat middlings and shorts; 106 mixed wheat feeds, 25 wheat bran and 5 red dog. Of the wheat middlings, 20 fell below guaranty in protein, 15 in fat and 75 exceeded guaranty in fiber; 43 were adulterated and 3 misbranded. Of the 106 mixed wheat feeds, 9 fell below guaranty in protein, 6 in fat, 15 exceeded guaranty in fiber and one was misbranded.

Of the wheat bran, one fell below guaranty in protein, four exceeded guaranty in fiber, one adulterated and one misbranded. Of the red dog, one fell below guaranty in fat, two exceeded guaranty in fiber and two were misbranded.

Mixed Feeds (Wheat By-Products and Corn Bran)— Of the 161 analyses of samples of wheat by-products and corn bran, 23 fell below guaranty in protein, 15 in fat, 32 exceeded guaranty in fiber and one was adulterated.

Cotton Seed Meal—Of the 102 cotton seed meals analyzed, 21 fell below guaranty in protein and 29 exceeded guaranty in fiber. Of the 47 cotton seed feeds analyzed, 14 fell below guaranty in protein, 3 in fat and 16 exceeded guaranty in fiber.

Animal Products—Of the 36 animal products analyzed, 5 fell below guaranty in protein, one in fat and 7 exceeded guaranty in fiber.

Linseed Oil Meal—Of the 16 linseed oil meals analyzed, 4 fell below guaranty in protein and 2 exceeded guaranty in fiber.

Poultry Feeds—Of the 64 poultry feeds analyzed, 8 fell below guaranty in protein, 4 in fat, 10 exceeded guaranty in fiber and one was adulterated.

Stock Feeds—Of the 291 samples of stock feed analyzed, 40 fell below guaranty in protein, 35 in fat, 66 exceeded guaranty in fiber and 3 were adulterated.

Stock Feeds containing a material of little or no feeding value—Of the 117 samples analyzed, 11 fell below guaranty in protein, 5 in fat and 40 exceeded guaranty in fiber.

Rye Feeds—Of the 12 samples analyzed, one fell below guaranty in protein, 2 in fat and 6 exceeded guaranty in fiber. Of the 2 samples of mixed rye feed analyzed, one fell below in protein.

Corn products—Of the 49 samples of corn products analyzed, 3 fell below in protein, 8 in fat, 2 exceeded guaranty in fiber and 2 were misbranded.

Ground Barley—Of the 40 samples analyzed, 7 fell below guaranty in protein, 26 exceeded guaranty in fiber and 8 were adulterated.

Ground Oats—Of the 8 samples analyzed, one exceeded guaranty in fiber.

Miscellaneous By-Product Feeds—Of the 19 samples analyzed, 6 fell below guaranty in protein, 5 in fat, 10 exceeded guaranty in fiber and 2 were adulterated.

System of Tagging.

In addition to the information printed on the State tag, the Department uses a color scheme of three colors, black, red and yellow. This is done in order to classify the feeds relative to their general make-up and help the buyer to recognize by a glance at the tag the general character of the feed. This, in connection with the information printed on the tag, should serve as guide to the purchaser and give reasonable warning and an opportunity to make whatever investigation he desires before he accepts the feeds.

The color system is: First, a manila tag printed in black ink represents a feeding stuff made of the products or by-products of one grain or plant only, such as wheat, or corn, or cotton seed, etc. For example, wheat shorts, mixed wheat feed, wheat bran, cotton-seed meal or corn feed meal would bear manila tags printed with black ink. Such feeds are commonly known as "straight" feeds.

Second, a manila tag printed in red ink indicates that the feeding stuff is made of the products or by-products of two or more grains or plants, such as corn and wheat, or corn, wheat and cottonseed meal, etc. For example, a combination of corn feed meal, wheat bran, alfalfa meal, molasses and cottonseed meal would take a manila tag printed with red ink.

Third, a yellow tag printed in black ink indicates that a feeding stuff contains a material of little or no feeding value, or a material not classified as a concentrate, such as oat hulls, corncob meal, peanut hulls, cottonseed hulls, flax-plant refuse, clipped oat by-product, peat, etc.

CHEMICAL STANDARDS IN FORCE IN KENTUCKY.

Wheat Feeds.

	Min. Protein.	Min. Fat.	Max. Fiber
Mixed wheat feed	15.50	3.50	8.50
Wheat bran	14.50	3.50	10.00
Wheat middlings Wheat shorts	16.00	3.50	7.50
White wheat middlings	16.00	3.50	6.50
Red dog flour	15.00	3.50	3.50
Flour middlings	16.00	3.50	4.50

Poultry Feeds.

Maximum grit	5%

Alfalfa Meal.

Maximum fiber	32%

Rye Middlings.

Maximum fiber	6%

Corn Feed Meal.

Minimum protein	8.00%
Minimum fat	3.75%
Maximum fiber	5.00%

Cracked Corn.

Minimum protein	8.00%
Minimum fat	3.50%
Maximum fiber	3.00%

Ground Barley.

Maximum fiber	6.50%

Screenings.

Percentage of screenings required and statement whether ground or unground.

Materials of Little Or No Feeding Value.

Percentage of material of little or no feeding value must be stated.

Explanation of the Tables.

A detailed report of results is given in the tables of analyses. For convenience, the analyses of the same class of feeds are grouped together. In the table of analyses the manufacturer's guaranty is printed in bold-face figures.

Table I contains analyses of straight feeds, or feeds of one grain or plant only. The names of the grains or plants from which these feeds are made are given in alphabetical order and the names of the products of each grain or plant are given in alphabetical order also.

Table II contains a class of mixed feeds composed of wheat and corn and their by-products, with wheat screenings ranging from 1 to 15 per cent. The feeds in this group are composed almost wholly of wheat, but where corn product appears, corn bran is the principal ingredient and ranges from a trace to 15 or 20 per cent.

Brewers' dried grains, mixed middlings and palmo middlings are included in Table II as mixed feeds.

Table III includes all feeds termed "poultry feeds."

Table IV contains the miscellaneous mixed feeds made up of materials which are clearly classed as concentrates and a combination of grains or cereals.

Table V contains the miscellaneous mixed feeds containing a material or materials of little or no feeding value.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
	Animal Products				
763-18	Armour's Meat Meal	Armour Fertilizer Works	62.76	10.57	2.10
		Chicago, Ill.	60.00	6.00	2.00
761-20	Same	Same	58.50	9.56	2.55
			60.00	6.00	2.00
2166-19	Tankage	Edw. J. Butler & Co.	62.00	9.63	1.80
		Chicago, Ill.	60.00	6.00	6.00
2076-19	Darling's Fatfast Tankage	Darling & Co.	59.25	5.84	3.17
		Chicago, Ill.	50.00	0.50	3.00
2299-18	Darling's Meat Scraps	Darling & Co.	54.75	10.03	3.09
		Chicago, Ill.	50.00	0.50	3.00
1539-17	"Pig's Delight" Digester Meat and Bone Tankage	Eckert Meat Co.	41.75	11.13	5.75
		Henderson, Ky.	35.00	10.00	4.00
894-19	Eckert's Pig Delight	Eckert Packing Co., Inc.	39.25	12.06	5.68
		Henderson, Ky.	30.00	10.00	4.00
894-19	Same	Same	34.38	14.56	....
			30.00	10.00	4.00
2348-19	Pigrow Digester Tankage	Hopkins Fertilizer Co.	63.00	3.88	....
		New Albany, Ind.	60.00	5.00	....
156-18	Abattoir Brand Digester Tankage	The Joslin-Schmidt Co.	60.76	6.25	3.03
		Cincinnati, Ohio.	60.00	5.00	3.00
156-18	Same	Same	60.26	8.91	2.63
			60.00	5.00	3.00
2926-18	K. C. Brand Hog Feed	Kentucky Chemical Mfg. Co.	44.13	13.65	2.60
		Covington, Ky.	50.00	8.00	2.00
2714-20	K. C. Brand Meat Scraps	Kentucky Chemical Mfg. Co.	57.76	14.11	2.30
		Covington, Ky.	55.00	8.00	3.00
2818-18	Knight's Digester Tankage	Kingan & Co., Ltd.	63.88	7.06	0.85
		Indianapolis, Ind.	60.00	6.00	6.00
2444-18	Klarer Digester Meat and Bone Tankage	Klarer Provision Co., Inc.	38.31	8.25	3.68
		Louisville, Ky.	40.00	4.50	3.50
2088-20	Same	Same	43.75	8.52	2.33
			42.43	5.31	2.24
501-19	Big Sixty Meat Meal Digester Tankage	Morris & Co.	61.88	8.75	3.40
		Chicago, Ill.	60.00	6.00	5.00
501-19	Same	Same	70.12	7.05	1.58
			60.00	6.00	5.00
1263-19	Digester Tankage	Standard By-Products Co.	61.88	9.13	3.08
		Louisville, Ky.	60.00	5.00	4.00
1263-19	Same	Same	63.12	8.69	3.06
			60.00	5.00	4.00
1263-19	Same	Same	55.00	6.25	7.11
			60.00	5.00	4.00
1263-19	Standard Meat Meal	Standard By-Products Co.	65.50	5.65	2.13
		Louisville, Ky.	60.00	5.00	4.00
1263-19	Same	Same	68.63	7.14	1.76
			60.00	5.00	4.00
1942-19	Standard Meat Scraps	Standard By-Products Co.	43.38	11.57	3.23
		Louisville, Ky.	45.00	8.00	3.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
763-18	J. B. Polk Taylorsville.	Meat residues	
761-20	Henderson's Feed Store. Owensboro.	Same	Below guaranty in protein.
2166-19	Allendale Farms Shelbyville.	Meat residue, blood, bone	
2076-19	Wm. Addams Cynthiana.	Meat products	
2299-18	Ritter-Hennings Co. Louisville.	Meat products	
1539-17	Norris & Lackett Co. Henderson.	Same	Above guaranty in fiber.
894-19	F. H. Vogel Henderson.	Same	Above guaranty in fiber. Foreign matter present —dirt, hulls, sticks.
894-19	Same	Same	
2348-19	Layman Bros. Princeton.	Digester tankage, blood	Below guaranty in fat. Contains offal from stomach and intestines.
156-18	Wm. Addams Cynthiana.	Meat products	
156-18	J. H. Fedders & Sons Covington.	Same	Contains offal from stomach and intestines.
2926-18	Geo. Keller Newport.	Meat and bone scraps	Below guaranty in fiber.
2714-20	Blue Grass Com. Co. Lexington.	Meat scraps	
2818-18	Henderson F. & Com. Co. Henderson.	Meat Products	
2444-18	A. Schneider's Sons Louisville.	Meat residues, blood, bone	Below guaranty in protein.
2088-20	Same	Same	
501-19	Ritter-Hennings Co. Louisville.	Residue of animal matter exclusive of hoof and horn	
501-19	Wilson & Newman Russellville.	Same	Largely blood.
1263-19	Jas. M. Wright & Son Franklin.	Ground dried blood, meat scraps, ground residue from animal tissue exclusive of hoof and horn, ground bone.	
1263-19	City Coal Co. Fulton.	Same	
1263-19	McCauley & Cain Versailles.	Same	Inferior to guaranty. Below guaranty in protein and above in fiber.
1263-19	Mfrs. Warehouse	Ground dried blood, meat scraps, ground residue from animal tissue exclusive of hoof or horn, ground bone.	
1263-19	McDonald Bros. Mt. Sterling.	Same	
1942-19	Ritter-Hennings Co. Louisville.	Meat products	Below guaranty in protein.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
485-19	Swift's Digester Tankage	Swift & Co.	61.12	8.49	1.80
		Chicago, Ill.	60.00	5.00	3.00
485-20	Same	Same	57.25	8.08	2.40
			60.00	5.00	3.00
485-20	Same	Same	59.63	9.72	2.13
			60.00	5.00	3.00
485-20	Same	Same	57.88	9.34	2.15
			60.00	5.00	3.00
485-20	Same	Same	62.12	7.75	1.65
			60.00	5.00	3.00
485-21	Same	Same	56.62	6.25	....
			60.00	5.00	3.00
486-19	Swift's Meat Scraps	Swift & Co.	49.63	11.74	2.80
		Chicago, Ill.	50.00	6.00	3.00
486-20	Same	Same	53.26	12.25	1.45
			50.00	6.00	3.00
1428-19	Western Digester Tankage	Western Packing & Provision	64.50	10.20	2.30
		Co., Chicago, Ill.	60.00	6.00	3.00
1428-20	Western Digester Tankage	Western Packing & Provision	67.32	8.35	....
		Co., Chicago, Ill.	60.00	6.00	3.00
1011-20	"Red W Brand" Protein Tankage	Wilson & Co.	59.00	8.60	7.12
		Chicago, Ill.	60.00	6.00	5.00
1011-20	Same	Same	62.00	6.10	4.05
			60.00	6.00	5.00
	Barley Feed				
2919-20	Acme Ground Barley	Acme-Evans Co.	13.13	2.59	6.27
		Indianapolis, Ind.	11.00	1.75	3.50
2831-20	Ground Barley	Ballard & Ballard Co.	12.13	3.24	6.20
		Louisville, Ky.	11.00	2.00	5.00
2831-20	Same	Same	12.88	2.70	5.90
			11.00	2.00	5.00
1388-19	Barley Feed	Cincinnati Grain & Hay Co.	14.25	4.01	11.98
		Cincinnati, Ohio.	12.50	2.50	6.00
1388-19	Same	Same	11.88	3.88	16.63
			12.50	2.50	6.00
1388-19	Same	Same	13.63	4.39	11.42
			12.50	2.50	6.00
1388-20	Same	Same	11.88	3.01	9.10
			12.00	2.50	6.00
1388-20	Same	Same	13.25	3.73	14.27
			12.50	2.50	6.00
1388-20	Same	Same	14.00	3.84	12.28
			12.50	2.50	6.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
485-19	Oscar Farmer & Sons.... Louisville.	Meat residues..................	
485-20	J. J. Shaver & Co....... Mayfield.	Same	Below guaranty in protein.
485-20	C. S. Brent Seed Co..... Lexington.	Same	
485-20	Elmendorf Coal & F. Co. Lexington.	Same	Below guaranty in protein. Made of meat residue, blood, bone.
485-20	Wm. Addams........... Cynthiana.	Same	
485-21	H. P. Hawkins & Sons... Paducah.	Same	Much too low in protein.
486-19	Elmendorf Coal & F. Co. Lexington.	Meat residues..................	
486-20	Oscar Farmer & Sons... Louisville.	Same	
1428-19	McCauley & Cain....... Versailles.	Meat scraps, blood............	Contains offal from stomach or intestines.
1428-20	Henry Paris............ Marion.	Meat scraps, blood............	
1011-20	Cohen Bros............. Greenville.	Meat, blood, bone.............	Below guaranty in protein and above in fiber.
1011-20	E. T. Walker Co......... Glendale.	Same	Foreign matter present—dirt, hulls, sticks.
2919-20	William Addams........ Cynthiana.	Ground barley.................	Not true to name. Contains ground oats and ground corn. Above guaranty in fiber.
2831-20	Elmendorf Coal & F. Co. Lexington.	Barley	Above guaranty in fiber.
2831-20	Hudson & Farnan....... Lancaster.	Same	Above guaranty in fiber. Contains ground oats.
1388-19	Mfrs. Warehouse........	Barley	Above guaranty in fiber. Contains wheat bran, ground oats and ground corn.
1388-19	Bedford & Tuttle....... Winchester.	Same	Below guaranty in protein. Misbranded—above guaranty in fiber. Contains wild and cultivated oats. Weed seeds present. Excess of barley hulls.
1388-19	New Crescent Lumber Co. Danville.	Same	Misbranded—Above guaranty in fiber. Contains ground oats, wheat bran and weed seeds.
1388-20	Flavo Milling & Gr. Co. Somerset.	Same	Above guaranty in fiber. Contains ground oats.
1388-20	Garrard Milling Co...... Lancaster.	Same	Above guaranty in fiber. Adulterated with oats and wild buckwheat.
1388-20	Bedford & Tuttle....... Winchester.	Same	Mislabeled—Above guaranty in fiber. Contains ground oats.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1388-20	Barley Feed	Cincinnati Grain & Hay Co.	11.50	3.83	8.10
		Cincinnati, Ohio.	12.50	2.50	6.00
1388-20	Same	Same	12.25	4.28	15.18
			12.50	2.50	6.00
149-19	Barley Meal	The Dorsel Co...............	11.75	4.76	8.36
		Newport, Ky.	12.50	2.50	6.00
149-20	Dorsel's Barley Meal	Same	12.13	4.24	6.88
			12.50	2.50	6.00
16-19	Ground Barley	The Early & Daniel Co.......	12.38	2.69	5.95
		Covington, Ky.	12.50	2.50	6.00
16-19	Same	Same	12.25	2.21	6.10
			12.50	2.50	6.00
567-19	Same	The Early & Daniel Co.......	11.50	3.28	4.88
		Cincinnati, Ohio.	12.50	2.50	6.00
567-19	Same	Same	12.25	2.75	6.70
			12.50	2.50	6.00
567-19	Same	Same	12.50	2.52	6.45
			12.50	2.50	6.00
567-20	Same	Same	12.25	2.39	6.83
			12.50	2.50	6.00
567-20	Same	Same	11.88	2.39	6.95
			12.50	2.50	6.00
567-20	Same	Same	12.00	2.49	6.85
			12.50	2.50	6.00
567-20	Same	Same	12.00	3.04	6.48
			12.50	2.50	6.00
567-20	Same	Same	12.25	2.64	6.68
			12.50	2.50	6.00
1339-19	Arrow Ground Barley	Edinger & Co...............	12.38	2.37	3.60
		Louisville, Ky.	11.00	1.80	5.20
1707-19	Ground Barley	The Eikenberry-Fitzgerald Co.	11.63	3.31	11.88
		Cincinnati, Ohio.	11.00	3.50	13.00
2349-19	Ground Barley	Eminence Milling Co........	12.75	2.50	5.08
		Eminence, Ky.	12.00	2.25	5.50
2349-19	Same	Same	13.25	2.99	5.43
			12.00	2.25	5.50
2861-20	Crimped Barley	Same	11.75	2.62	6.10
			12.00	2.25	5.50
1591-19	Barley Feed	T. G. Jewett & Sons.........	12.50	4.31	10.12
		Portsmouth, Ohio	12.00	3.09	10.00
202-19	Barley Feed	George Keller...............	12.75	3.83	13.70
		Newport, Ky.	11.50	3.09	11.05
2867-20	Barley Feed	Ladish Milling Co..........	12.00	2.97	8.71
		Milwaukee, Wis.	11.00	1.75	6.50
1707-20	Ground Barley	The Nutritia Co.............	13.25	3.39	12.03
		Cincinnati, Ohio.	11.00	3.50	7.00

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1388-20	R. A. Dodd Nicholasville.	Barley	Below guaranty in protein. Contains corn meal, ground oats and ground weed seeds. Above guaranty in fiber.
1388-20	Headley & Co. Lexington.	Same	Above guaranty in fiber. Ground barley and hulls Containing ground oats.
149-19	Miss L. Kuechler Ft. Thomas.	Ground barley	Below guaranty in protein and above in fiber. Contains ground oats, corn bran and weed seeds.
149-20	Mfrs. Warehouse	Barley	Adulterated with wild oats and ground corn. Above guaranty in fiber.
16-19	David Caldwell Williamstown.	Ground barley	Should be called ground barley and ground oats.
16-19	Millersburg Mills Millersburg.	Same	Contains ground oats.
567-19	Cleveland & Co. Versailles.	Same	Below guaranty in protein. Contains ground corn and corn meal.
567-19	Payne & Estes Eubank.	Same	Above guaranty in fiber.
567-19	I. F. Tabb Mt. Sterling.	Same	Contains ground oats.
567-20	Kentucky Feed Co. Flemingsburg.	Same	Above guaranty in fiber. Contains wild oats.
567-20	J. H. Tate & Co. Monticello.	Same	Above guaranty in fiber. Contains ground oats. Below guaranty in protein.
567-20	A. L. Voris Burgin.	Same	Inferior article and not as guaranteed. Above guaranty in fiber.
567-20	J. F. Griffin Mt. Vernon.	Same	Below guaranty in protein. Contains ground oats.
567-20	Hudson & Davis Danville.	Same	Above guaranty in fiber. Not pure barley.
1339-19	Lessenberry & Jones Glasgow.	Barley	
1707-19	Bedford & Tuttle Winchester.	Ground barley	Misbranded—Mixture of barley, wild oats and weed seeds.
2349-19	Farmers & Consumers Co. Frankfort.	Whole ground barley	Contains a large amount of ground oats.
2349-19	G. C. Shaw Frankfort.	Same	Contains cultivated and wild oats ground.
2861-20	Mfrs. Warehouse	Same	Above guaranty in fiber. Not properly labeled.
1591-19	J. F. Bertram Vanceburg.	Barley	Contains wild and cultivated oats and weed seeds.
202-19	Mfrs. Warehouse	Ground barley	Above guaranty in fiber. Should not be classified as barley feed. Contains ground oats. Color dark.
2867-20	Layman Bros. Princeton.	Barley	Above guaranty in fiber. Contains ground oats.
1707-20	N. B. Triplet Waynesburg.	Barley	Above guaranty in fiber. Contains a large percent of oats and oat hulls, also pigeon grass.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot	Fat	Fiber
1707-20	Ground Barley	The Nutritia Co.	13.13	3.64	10.45
		Cincinnati, Ohio.	11.00	3.50	7.00
1707-20	Same	Same	12.88	3.47	11.30
			11.00	3.50	7.00
1707-20	Same	Same	13.25	3.33	6.04
			11.00	3.50	7.00
1725-19	Vitality Ground Barley	Rosenbaum Bros.	12.88	2.21	6.00
		Chicago, Ill.	11.00	2.00	7.00
1725-19	Same	Same	13.25	2.74	7.02
			11.00	2.00	7.00
1725-19	Same	Same	13.00	2.38	8.03
			11.00	2.00	7.00
2801-20	Fine Ground Whole Barley	Schreiber Milling & Grain Co.	12.25	2.90	7.00
		Minneapolis, Minn.	13.00	2.50	6.00
1327-19	Ground Whole Barley	Washburn-Crosby Co.	12.00	2.73	6.83
		Minneapolis, Minn.	10.00	2.00	10.00
	Cracked Corn				
1943-18	Cracked Corn	J. J. Badenoch Co.	9.50	4.73	1.68
		Chicago, Ill.	7.50	4.00	2.50
1335-19	Cracked Corn	Kenton Hay & Grain Co.	9.50	4.27	1.96
		Latonia, Ky.	8.62	4.85	2.25
698-20	"Nutritia" Cracked Corn	The Nutritia Co.	9.75	4.75	2.85
		Cincinnati, Ohio.	10.00	4.00	2.00
698-20	Same	Same	8.75	2.55	2.08
			10.00	4.00	2.00
1938-16	Cracked Corn	Pee Pee Milling Co.	9.50	4.56	2.04
		Waverly, Ohio.	7.30	3.65	2.25
3039-20	Cracked Corn	Prairie State Milling Co.	9.63	4.49	1.73
		Chicago, Ill.	10.00	5.00	2.00
2987-20	Wavoto Cracked Corn	Stritmatter Grain & Milling	8.88	3.24	1.91
		Co., Waverly, Ohio.	10.00	3.10	5.40
1731-20	Cracked Corn	Washington Milling Co.	9.13	3.91	2.52
		Washington C. H., Ohio.	8.97	4.16	4.16
580-20	Crushed Corn	Roszell Bros.	9.50	4.32	2.10
		Lexington, Ky	8.75	4.00	1.90
	Corn Chops				
169-19	Corn Chop	Ashland Milling Co.	9.13	3.31	1.99
		Ashland, Ky.	8.50	3.52	2.00
267-15	Corn Chop	Eagle Mills	9.00	3.44	2.05
		Franklin, Ky.	8.69	3.75	2.00
2356-19	Corn Chop	R. U. Kevil & Sons	9.00	3.08	1.90
		Mayfield, Ky.	8.65	4.00	2.00
798-18	"Quail" Chop	Madisonville Milling Co.	9.63	3.75	2.89
		Madisonville, Ky.	8.65	3.93	1.75

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1707-20	Anderson & Spillman Danville.	Barley	Above guaranty in fiber. Contains a large amount of wild and cultivated oats, also weed seed.
1707-20	Dorsey Bros. & Fisher Carlisle.	Same	Above guaranty in fiber. Badly adulterated with oats and oat hulls, also barley hulls.
1707-20	Hudson & Farnan Lancaster.	Same	Contains wild and cultivated oats.
1725-19	Sandusky Bros. Harrodsburg.	Barley	Contains small amount of ground oats.
1725-19	Amos Yeager Louisville.	Same	Contains a trace of ground oats.
1725-20	Edw. M. Riedling Louisville.	Same	Above guaranty in fiber.
2801-20	Henderson F. & Com. Co. Henderson.	Whole barley	Below guaranty in protein and above in fiber.
1327-19	Owen & Ducker Butler.	Barley	
1943-18	C. S. Brent Seed Co. Lexington.	Corn	
1335-19	Mfrs. Warehouse	Corn	
698-20	Bacon R. Moore Torrent.	Shelled corn	
698-20	Same	Same	Below guaranty in protein and fat.
1938-16	J. K. Butcher & Co. Paintsville.	Corn	
3039-20	Same	Cracked corn	
2987-20	N. D. Tabor Olive Hill.	Shelled corn	Below guaranty in protein.
1731-20	Ashland Iron & Min. Co. Ashland.	Shelled corn	
580-20	Thos. Jameson & Son Beattyville.	Shelled corn	
169-19	Qualls & Dennes Olive Hill.	Corn chop	
267-15	Mfrs. Warehouse	Shelled corn	
2356-19	Mfrs. Warehouse	Shelled corn	Below guaranty in fat.
798-18	Mfrs. Warehouse	Corn	Above guaranty in fiber.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot	Fat	Fiber
	Corn Feed Meal				
310-19	Homlik Feed	Acme-Evans Co.	10.00	5.79	3.74
		Indianapolis, Ind.	8.50	3.00	4.00
544-20	Corn Feed Meal	J. J. Badenoch Co.	9.00	4.00	4.39
		Chicago, Ill.	6.00	1.00	2.00
2798-20	Corn Feed Meal	Ballard & Ballard Co.	9.63	4.43	3.03
		Louisville, Ky.	10.00	3.70	2.90
321-20	Dorsel's Corn Meal	The Dorsel Co.	9.38	3.84	2.03
		Newport, Ky.	9.00	4.00	2.00
269-20	Corn Feed Meal	The Early & Daniel Co.	10.00	5.47	2.59
		Covington, Ky.	8.43	4.29	5.00
	Corn Gluten Feed				
......	Corn Gluten Feed	American Milling Co.	23.50	2.30	7.25
		Peoria, Ill.	23.00	2.00	8.50
2553-20	Corn Gluten Feed	Cincinnati Grain & Hay Co.	23.25	2.61	6.55
		Covington, Ky.	23.00	1.00	8.50
2553-20	Same	Same	29.63	8.54	8.43
			23.00	1.00	8.50
	Corn Oil Cake				
1922-19	Arrow Corn Oil Cake	Edinger & Co.	22.50	6.13	8.83
		Louisville, Ky.	18.00	8.00	10.00
	Hominy Feed				
824-19	Homco Hominy Feed, Corn Screenings and part of the germ rm'v'd	American Hominy Co.	10.13	7.81	4.48
		Indianapolis, Ind.	10.00	6.00	6.00
2904-20	Hominy Feed	Aunt Jemima Mills Co.	12.75	4.89	5.06
		St. Joseph, Mo.	10.00	5.00	8.00
639-20	Hominy Feed Meal	Ballard & Ballard Co.	11.50	8.53	4.93
		Louisville, Ky.	10.50	7.50	5.98
1550-20	Hominy Feed	Cincinnati Grain & Hay Co.	12.25	9.56	6.00
		Covington, Ky.	11.00	8.45	7.50
1550-20	Same	Same	11.88	8.17	5.22
			11.00	8.45	7.50
584-20	Hominy Meal	The Early & Daniel Co.	11.88	5.71	5.44
		Cincinnati, Ohio.	9.86	8.00	7.00
1101-20	Arrow Hominy Feed	Edinger & Co.	11.50	6.43	5.98
		Louisville, Ky.	10.22	6.72	5.50
2509-20	Hominy Meal	J. H. Fedders & Sons	9.50	3.99	2.29
		Covington, Ky.	10.25	7.75	7.50
1084-18	Hominy Meal	George Keller	9.63	4.10	2.30
		Newport, Ky.	9.10	6.50	7.50

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
310-19	Thompson Grocery Co. Pineville.	Reground corn feed meal	
544-20	Edw. M. Riedling	Corn by-product	Guaranty too low.
2798-20	Elmendorf Coal & F. Co.	Corn	
321-20	Mrs. Young & Son	Corn	
269-20	Herman Feldmann	Corn	
......	Louisville Hay & Gr. Co. Louisville.	Corn	
2553-20	Berea College Dairy Berea.	Corn	
2553-20	Same	Same	Dark color—contains barley malt.
1922-19	Mfrs. Warehouse	Corn germ meal	Below guaranty in fat.
824-19	The Cin. Gr. & Hay Co. Covington.	By-product from the manufacturer of grits, meal and flake with corn screenings added and part of the germ removed.	
2904-20	Jellico Grocery Co. Middlesboro.	Corn by-products	
639-20	La Grange F. & Gr. Co. LaGrange.	Corn	
1550-20	Kahmann & Renhkamp Covington.	Corn	
1550-20	Mfrs. Warehouse Erlanger.	Corn	
584-20	Mfrs. Warehouse Erlanger.	Corn	Below guaranty in fat.
1101-20	Shelby Co. F. & Gr. Co. Shelbyville.	Corn	
2509-20	W. L. Kirkpatrick Burlington.	Corn	Below guaranty in protein and fat. Not hominy meal but corn feed meal. Mislabeled.
1084-18	Mrs. Young & Son Ft. Thomas.	Corn	Not hominy meal but corn feed meal—Mislabeled. Below guaranty in fat.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2549-20	"Kemco" White Hominy Feed	Kentucky Elevator & Milling	10.75	7.25	4.53
		Co., Paducah, Ky.	10.13	7.53	5.13
2549-20	Same	Same	11.50	8.17	4.95
			10.13	7.53	5.13
1199-19	"Acorn" Hominy Feed	W. L. Kimbrough & Sons	11.63	9.48	4.75
		Guthrie, Ky.	10.00	7.50	6.50
2707-20	Badger Hominy Feed	Chas. A. Krause Milling Co.	11.75	7.12	4.43
		Milwaukee, Wis.	10.00	6.00	5.00
2707-20	Same	Same	10.88	4.81	5.25
			10.00	6.00	5.00
941-19	Noxall Mill Feed	Lack-Redford Elevator Co.	11.50	7.90	6.23
		Paducah, Ky.	11.70	8.05	9.50
941-19	Same	Same	11.38	8.65	4.53
			11.70	8.05	9.50
1758-20	Corn Feed	Lexington Roller Mills Co.	10.75	6.37	7.03
		Lexington, Ky.	10.40	8.70	10.95
1027-19	Dandy Hominy Feed	Louisville Milling Co.	11.00	7.72	4.82
		Louisville, Ky.	10.00	6.50	6.00
1027-19	Same	Same	11.25	7.85	4.97
			10.00	6.50	6.00
1027-19	Same	Same	11.50	8.97	5.48
			10.00	6.50	6.00
1027-20	Same	Same	12.00	6.76	5.85
			10.00	6.50	6.00
2681-18	Mead's Hominy Feed	Mead Johnson & Co.	11.50	7.63	4.75
		Evansville, Ind.	10.00	6.00	5.00
2089-20	Hominy Feed	Owensboro Milling Co.	12.75	6.84	3.16
		Owensboro, Ky.	10.50	8.10	7.25
1895-19	Hominy Meal	Wathen Milling Co.	10.63	6.90	5.53
		Louisville, Ky.	10.00	6.00	7.00
1895-20	Same	Same	10.25	5.90	6.28
			10.00	6.00	7.00
1895-20	Same	Same	13.00	5.85	8.03
			10.00	6.00	7.00
1895-20	Same	Same	10.88	7.02	5.20
			10.00	6.00	7.00
	Choice Cotton Seed Meal				
2444-20	"Lone Star Brand" High Grade Cotton Seed Meal	F. W. Brode & Co.	40.75	6.69	12.83
		Memphis, Tenn.	43.00	6.00	9.00
1264-19	"Owl Brand" Cotton Seed Meal	Same	41.00	7.06	10.10
			41.00	6.00	10.00
1264-19	Same	Same	40.25	7.61	8.43
			41.00	6.00	10.00
1264-19	Same	Same	42.31	7.43	10.30
			41.00	6.00	10.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2549-20	H. P. Hawkins' Sons Paducah.	White hominy feed	
2549-20	Herbert Hawkins Paducah.	Same	
1199-19	Mfrs. Warehouse Guthrie.	Corn	
2707-20	Joe List Covington.	Corn	
2707-20	C. J. Clausen Louisville.	Corn	Contains ground oats. Below in fat.
941-19	M. J. Yopp Seed Co. Paducah.	Pure corn hearts, pure corn bran	
941-19	H. P. Hawkins' Sons Paducah.	Same	
1758-20	Corbin F. & Grocery Co. Corbin, Ky.	Corn hearts, corn bran	Below guaranty in fat.
1027-20	H. P. Hawkins' Sons Paducah.	A by-product from the manufacture of hominy, hominy grits, and corn meal by the degerminating process.	
1027-19	Harlan Co-operative Store Harlan.	By-product from the manufacture of hominy, hominy grits and corn meal.	
1027-19	La Grange F. & Gr. Co. LaGrange.	Hominy grits, corn meal	
1027-20	Cogar Gr. Coal & F. Co. Harrodsburg.	By-product from the manufacture of hominy, hominy grits and corn meal.	
2681-18	C. L. Jewell Horse Cave.	Corn products	
2089-20	Elkin & Kimmel Greenville.	Corn by-products	Below guaranty in fat.
1895-19	Dickinson Bros. Glasgow.	Corn	
1895-20	Jellico Grocery Co. Middlesboro.	Corn	
1895-20	C. L. Jewell Horse Cave.	Corn	Above guaranty in fiber.
1895-20	Berea College Dairy Berea.	Corn	
2444-20	I. F. Tabb Mt. Sterling.	Cotton seed	Below guaranty in protein and above in fiber. Contains an excess of hulls.
1264-19	Oscar Farmer & Sons Louisville.	Same	
1264-19	N. Y. Landrum & Co. Tomkinsville.	Same	Below guaranty in protein.
1264-19	Hodgenville Hdw. Co. Hodgenville.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1264-19	"Owl Brand" Cotton Seed Meal.	F. W. Brode & Co..........	40.38	7.19	9.80
		Memphis, Tenn.	41.00	6.00	10.00
1264-19	Same	Same	41.00	7.63	10.18
			41.00	6.00	10.00
1264-19	Same	Same	41.00	8.57	12.08
			41.00	6.00	10.00
1264-19	Same	Same	41.50	7.09	10.95
			41.00	6.00	10.00
1264-19	Same	Same	40.19	7.25	11.50
			41.00	6.00	10.00
1264-19	Same	Same	41.38	7.78	10.25
			41.00	6.00	10.00
1264-19	Same	Same	41.31	6.87	10.33
			41.00	6.00	10.00
1264-19	Same	Same	41.06	7.90	9.85
			41.00	6.00	10.00
1264-19	Same	Same	43.44	7.45	9.53
			41.00	6.00	10.00
1264-19	Same	Same	43.06	7.98	8.88
			41.00	6.00	10.00
1264-19	Same	Same	42.44	8.63	9.23
			41.00	6.00	10.00
1264-19	Same	Same	44.69	8.24	7.15
			41.00	6.00	10.00
1264-19	Same	Same	42.56	8.05	8.35
			41.00	6.00	10.00
1264-19	Same	Same	42.56	7.83	9.63
			41.00	6.00	10.00
1264-19	Same	Same	41.19	7.20	10.85
			41.00	6.00	10.00
1264-19	Same	Same	42.69	8.73	8.88
			41.00	6.00	10.00
1264-20	Same	Same	40.13	9.03	13.09
			41.00	6.00	10.00
1264-20	Same	Same	41.00	9.22	6.48
			41.00	6.00	10.00
1264-21	Same	Same	41.26	7.58	8.55
			41.00	6.00	10.00
266 15	Golden Yellow Brand Cotton Seed	Brownsville Cotton Oil & Ice	43.44	8.50	8.25
	Meal	Co., Brownsville, Tenn.	41.00	6.00	10 00
266-15	Same	Same	42.26	6.78	7.90
			41.00	6.00	10.00
2097-19	"Gold Dust Brand" Cotton Seed	E. B. Burke..............	41.44	7.70	9 68
	Meal	Helena, Ark.	41.00	5.50	10.00
2097-19	Same	Same	40.38	7.59	13.15
			41.00	5.50	10.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS VARIANCE FROM GUARANTY
1264-19	H. D. Stiles............ Bardstown.	Cotton seed.....................	Below guaranty in protein.
1264-19	Abell, Brown & Co...... Bardstown.	Same	
1264-19	Morgan & Crenshaw.... Georgetown.	Same	Above guaranty in fiber. Dark color and considerable hulls. Made from weather damaged seed.
1264-19	Mitchell & Sons........ Smith's Grove.	Same	
1264-19	E. L. Burks............ Hardyville.	Same	Below guaranty in protein. Above guaranty in fiber.
1264-19	J. S. McMurtry........ Elizabethtown.	Same	
1264-19	Same	Same	
1264-19	R. B. Hayes & Co...... Hodgenville.	Same	
1264-19	S. J. Patterson......... Sonora.	Same	
1264-19	G. H. Kinkade.......... Sonora.	Same	
1264-19	Ray Dickerson.......... Bardstown.	Same	
1264-19	Abell-Brown & Co....... Bardstown.	Same	
1264-19	James Henry & Sons.... Taylorsville.	Same	
1264-19	Abell-Brown & Co....... Bardstown.	Same	
1264-19	S. J. Patterson.......... Sonora.	Same	Above guaranty in fiber.
1264-19	W. M. Bright.......... Stanford.	Same	
1264-20	Mitchell & Sons........ Smith's Grove.	Same	Below guaranty in protein and above guaranty in fiber.
1264-20	Geo. P. Taylor Co....... Somerset.	Same	
1264-21	I. F. Tabb............. Mt. Sterling.	Same	
266-15	Franklin Ele. & Warehouse Co., Franklin.	Same	
266-15	J. W. James Grocery Co. Franklin.	Same	
2097-19	L. C. Alderson.......... Bowling Green.	Same	
2097-19	T. M. Wilson........... Bowling Green.	Same	Below guaranty in protein and above in fiber.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
3022-18	"Eagle Brand" Choice Cotton	The Cottonseed Products Co.	40.94	9.08	9.48
	Seed Meal	Louisville, Ky.	**41.00**	**6.00**	**10.00**
3022-18	Same	Same	42.38	8.35	9.15
			41.00	**6.00**	**10.00**
2200-20	Same	Same	40.13	8.28	12.38
			41.00	**6.00**	**10.00**
2200-19	Same	Same	41.38	7.25	9.46
			41.00	**6.00**	**10.00**
2200-19	"Eagle Brand" Cotton Seed Meal	Same	42.50	7.03	10.98
			41.00	**6.00**	**10.00**
2200-19	Same	Same	42.88	8.96	11.85
			41.00	**6.00**	**10.00**
2200-20	Same	Same	40.88	7.73	8.00
			41.00	**6.00**	**10.00**
2200-20	Same	Same	41.00	8.84	8.18
			41.00	**6.00**	**10.00**
2200-20	Same	Same	41.00	6.95	10.08
			41.00	**6.00**	**10.00**
......	Cotton Seed Meal	Dallas Oil & Refining Co....	41.38	9.05	11.37
		Dallas, Texas.	**43.00**	**5.00**	**12.00**
1083-19	Choice Cotton Seed Meal	Edinger & Co...............	41.88	7.07	11.80
		Louisville, Ky.	**41.00**	**6.00**	**10.00**
1083-19	Same	Same	40.50	7.36	12.91
			41.00	**6.00**	**10.00**
1083-20	Same	Same	41.88	6.99	9.70
			41.00	**6.00**	**10.00**
1083-20	Same	Same	40.88	7.62	11.37
			41.00	**6.00**	**10.00**
1083-20	Same	Same	41.00	6.64	9.92
			41.00	**6.00**	**10.00**
......	Ordinary Cotton Seed	Fort Worth Cotton Oil Mill..	45.88	7.30	7.68
		Fort Worth, Texas.	**43.00**	**6.00**	**12.00**
2043-19	Choice Cotton Seed Meal	E. L. Gross & Co.............	41.44	7.05	11.50
		Louisville, Ky.	**41.00**	**7.00**	**11.00**
2043-19	Same	Same	40.19	6.74	11.65
			41.00	**7.00**	**11.00**
968-19	"Dixie Brand" Cotton Seed Meal	Humphreys-Godwin Co.......	42.06	6.39	10.93
		Memphis, Tenn.	**41.00**	**5.50**	**10.00**
968-20	Same	Same	41.38	8.14	9.30
			41.00	**5.50**	**10.00**
968-19	Same	Same	42.75	8.01	8.60
			41.00	**5.50**	**10.00**
968-19	Same	Same	40.25	7.74	8.37
			41.00	**5.50**	**10.00**
968-19	Same	Same	41.50	7.97	8.03
			41.00	**5.50**	**10.00**
968-20	Same	Same	41.00	6.87	10.33
			41.00	**5.50**	**10.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
3022-18	C. J. Clausen.......... Louisville.	Cotton seed..................	
3022-18	Oscar Farmer & Sons.... Louisville.	Same	
2200-20	Amos Yaeger.......... Louisville.	Same	Below guaranty in protein and above in fiber.
2200-20	Smith & Dawson........ Shepherdsville.	Same	
2200-19	Climax Roller Mills..... Shelbyville.	Same	Above guaranty in fiber.
2200-19	Berea College Dairy.... Berea.	Same	Same.
2200-20	Abell & Hurst......... Bardstown.	Same	
2200-20	Same	Same	
2200-20	Kalarama Farms........ Springfield.	Same	
......	Leitchfield Milling Co... Leitchfield.	Same	Below guaranty in protein and above in fiber.
1083-19	John H. Lowe.......... Smith's Grove.	Decorticated cotton seed........	Above guaranty in fiber.
1083-19	Same	Same	Same.
1083-20	Shelby Co. F. & Gr. Co. Shelbyville.	Same	
1083-20	LaGrange F. & Gr. Co. LaGrange.	Same	Above guaranty in fiber.
1083-20	Same	Same	
......	W. T. Robinson........ Burgin.	Cotton seed..................	
2043-19	Duncan & Sherley...... LaGrange.	Same	Above guaranty in fiber.
2043-19	R. O. Duncan........... LaGrange.	Same	Below guaranty in protein and above in fiber. This shipment was plugged with bags of inferior meal.
968-19	J. S. Bunnell........... Horse Cave.	Pressed cotton seed...........	Above guaranty in fiber.
968-20	R. B. Hayes & Co....... Hodgenville.	Same	
968-19	Monarch Milling Co..... Mt. Sterling.	Same	
968-19	E. S. Speed............ Taylorsville.	Same	Below guaranty in protein.
968-19	Baskett Grain Co....... Henderson.	Same	
968-20	Hulen-Toops Co......... Bowling Green.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
968-20	"Dixie Brand" Cotton Seed Meal	Humphreys-Godwin Co.	40.38	7.00	9.43
		Memphis, Tenn.	41.00	5.50	10.00
2202-20	"Bull Brand" Cotton Seed Meal	Same	42.63	9.69	8.65
			43.00	6.00	10.00
2892-20	"Longhorn Brand" Cotton Seed Meal	Industrial Cot. Oil Properties	42.63	8.21	9.80
		New York City, N. Y.	43.00	6.00	12.00
336-19	"Supreme Brand" Cotton Seed Meal	W. B. Johnson & Co.	40.69	6.72	10.55
		Memphis, Tenn.	41.00	7.00	10.00
336-19	Same	Same	42.25	7.82	10.22
			41.00	7.00	10.00
336-19	Same	Same	42.63	7.75	12.41
			41.00	7.00	10.00
336-20	Same	Same	40.00	8.34	7.93
			41.00	7.00	10.00
1258-21	"Lake" Choice Cotton Seed Meal	Lake County Mfg. Co.	42.38	8.06	7.55
		Tiptonville, Tenn.	41.00	6.00	10.00
2162-20	"Lovitt Brand" Cotton Seed Meal	L. B. Lovitt & Co.	40.44	7.81	7.80
		Memphis, Tenn.	41.00	5.00	10.00
331-20	Choice Brand Cotton Seed Meal	C. L. Montgomery Co.	38.88	9.00	10.55
		Memphis, Tenn.	41.00	6.00	8.00
331-20	Same	Same	40.38	8.17	7.64
			41.00	6.00	8.00
2046-20	"Green Bee" Cotton Seed Meal	W. C. Nothern	40.00	8.29	8.15
		Memphis, Tenn.	43.00	6.50	10.00
2465-20	"Bee Brand" Cotton Seed Meal.	Same	39.50	6.95	9.55
			41.00	6.00	12.00
......	Special Quality Cotton Seed Meal	Osage Cotton Oil Co.	42.94	6.95	11.83
		Kansas City, Mo.	43.00	6.00	12.00
3088-20	Cotton Seed Meal	Owensboro Milling Co.	39.25	8.45	12.95
		Owensboro, Ky.	41.00	7.00	10.00
573-18	Choice Cotton Seed Meal	Phoenix Cotton Oil Co.	40.75	6.99	11.73
		Dyersburg, Tenn.	41.00	7.00	10.00
435-20	"Phoenix" Choice Cotton Seed Meal	Same	41.38	7.59	9.05
			41.00	7.00	10.00
435-20	Same	Same	40.50	7.13	9.65
			41.00	7.00	10.00
......	Ordinary Cotton Seed Meal	Pilot Point Cot. Oil Mill Co.	42.50	6.97	10.50
		Pilot Point, Texas.	43.00	6.00	12.00
2058-21	Cotton Seed Meal	Rapier Sugar Feed Co.	44.26	7.35	10.65
		Owensboro, Ky.	41.00	7.50	10.00
3131-21	Sansom's Choice 41% Cotton Seed Meal	J. M. Sansom & Co.	43.50	7.70	6.72
		Dallas, Texas.	41.20	6.00	10.00
2236-19	Superfine Brand	Steele-Kolb By-Products Co.	41.75	7.92	10.77
		Birmingham, Ala.	41.00	6.50	9.00
2929-20	Cotton Seed Meal	The Sugarine Co.	44.88	7.23	8.78
		Owensboro, Ky.	43.00	6.50	10.00
3115-21	Texoma Brand	Texas Cake & Linter Co.	44.00	6.30	11.10
		Dallas, Texas.	43.00	6.00	12.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
968-20	R. B. Hutchcraft Paris.	Pressed cotton seed	Below guaranty in protein.
2202-20	R. B. Hayes & Co. Hodgenville.	Same	
2892-20	Geo. W. Maraman & Sons Shepherdsville.	Cotton seed meal	
336-19	J. S. Bunnell Horse Cave.	Cotton seed	Above guaranty in fiber.
336-19	B. L. Wilson Cave City.	Same	
336-19	J. C. Walton Smith's Grove.	Same	Above guaranty in fiber.
336-20	J. P. Summers Smith's Grove.	Same	Below guaranty in protein.
1258-21	H. P. Hawkins & Sons Paducah.	Same	
2162-20	S. B. Jones Pembrook.	Cotton seed meal	Below guaranty in protein.
331-20	J. H. Baughman & Co. Stanford.	Pressed cotton seed	Below guaranty in protein and above in fiber.
331-20	J. C. Bierley & Sons Carrs.	Same	Below guaranty in protein.
2046-20	B. R. Sanders Rocky Hill.	Pressed cotton seed	Below guaranty in protein.
2465-20	E. F. Spears & Sons Paris.	Same	Same.
......	J. A. Robinson Stanford.	Cotton seed	
3088-20	V. B. Embry & Son Caneyville.	Same	Below guaranty in protein and above in fiber. Dark color. Excess hulls.
573-18	R. D. Robertson Mayfield.	Decorticated cotton seed	Above guaranty in fiber.
435-20	H. H. Thomas Leitchfield.	Same	
435-20	H. B. Snider Caneyville.	Same	
......	Hudson & Farnan Lancaster.	Cotton seed	
2058-21	Mrs. G. C. McReynolds Lewisburg.	Same	Above guaranty in fiber.
3131-21	LaGrange F. & Gr. Co. LaGrange.	Decorticated cotton seed	
2236-19	W. L. Kimbrough & Son Guthrie.	Cotton seed meal	Above guaranty in fiber.
2929-20	Am. Cooperative Assoc. Owensboro.	Cotton seed	
3115-21	Blue Grass Com. Co. Lexington.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
......	"Sunset Brand" Prime Cotton Seed Meal	Texas Cake & Linter Co.	42.50	6.60	11.08
		Dallas, Texas.	**41.00**	**5.00**	**14.00**
......	"Higrade Brand" Cotton Seed Meal	Same	45.00	7.96	8.17
			45.00	**6.00**	**10.00**
	Prime Cotton Seed Meal				
3026-20	"Hereford Brand" 38.62% Cotton Seed Meal	T. O. Branch Co.	38.50	7.60	9.24
		Little Rock, Ark.	**38.62**	**6.00**	**8.00**
2122-19	"Dove Brand" Cotton Seed Meal	F. W. Brode & Co.	38.94	7.80	11.75
		Memphis, Tenn.	**38.62**	**6.00**	**12.00**
2122-19	Same	Same	38.94	7.17	11.60
			38.62	**6.00**	**12.00**
2122-19	Same	Same	38.56	7.70	12.38
			38.62	**6.00**	**12.00**
2122-19	Same	Same	42.31	7.65	9.18
			38.62	**6.00**	**12.00**
2122-19	Same	Same	41.19	8.08	8.85
			38.62	**6.00**	**12.00**
2122-19	Same	Same	40.19	8.15	10.65
			38.62	**6.00**	**12.00**
2122-19	Same	Same	39.44	7.35	13.00
			38.62	**6.00**	**12.00**
2122-19	Same	Same	39.06	7.42	11.70
			38.62	**6.00**	**12.00**
2122-19	Same	Same	36.69	7.45	13.42
			38.62	**6.00**	**12.00**
2122-19	Same	Same	39.25	7.73	11.68
			38.62	**6.00**	**12.00**
2122-19	Same	Same	39.88	7.65	11.18
			38.62	**6.00**	**12.00**
2122-19	Same	Same	39.88	7.73	10.95
			38.62	**6.00**	**12.00**
2122-19	Same	Same	39.13	8.00	12.40
			38.62	**6.00**	**12.00**
2122-19	Same	Same	38.13	6.98	14.30
			38.62	**6.00**	**12.00**
2122-19	Same	Same	38.50	7.74	12.80
			38.62	**6.00**	**12.00**
2122-19	Same	Same	39.75	7.89	12.15
			38.62	**6.00**	**12.00**
2122-19	Same	Same	38.88	7.53	10.17
			38.62	**6.00**	**12.00**
2122-21	Same	Same	38.75	7.59	10.10
			38.62	**6.00**	**12.00**
781-19	"Burnett's Bourbon Brand" Cotton Seed Meal	The Wm. A. Burnett & Co.	39.88	7.75	11.63
		Louisville, Ky.	**38.62**	**6.00**	**12.00**
1084-19	Arrow Prime Cotton Seed Meal	Edinger & Co.	38.38	6.24	12.24
		Louisville, Ky.	**38.62**	**6.00**	**12.00**

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
......	Logan & Haggin Georgetown.	Cotton seed	
......	H. H. Thomas Leitchfield.	Same	
3026-20	Mrs. Young & Son Ft. Thomas.	Decorticated cotton seed	Above guaranty in fiber.
2122-19	Simpson County Hdw. Co. Franklin.	Cotton seed	
2122-19	Eminence Milling Co. Eminence.	Same	
2122-19	Sam Nahm & Co. Bowling Green.	Same	
2122-19	J. S. McMurtry Elizabethtown.	Same	
2122-19	G. H. Kinkade Sonora.	Same	
2122-19	J. H. Baughman & Co. Stanford.	Same	
2122-19	R. Lowery Leitchfield.	Same	Above guaranty in fiber.
2122-19	H. H. Thomas Leitchfield.	Same	
2122-19	Lile & Tate Leitchfield.	Same	Below guaranty in protein and above in fiber.
2122-19	C. T. Samuels Deatsville.	Same	
2122-19	Charles D. Bean Lenore.	Same	
2122-19	J. W. Shaunty Early Times.	Same	
2122-19	Hugh Bell Bloomfield.	Same	
2122-19	Beard Bros. Hardinsburg.	Same	Above guaranty in fiber.
2122-19	Martin-Hodgkin Sup. Co. Winchester.	Same	Same.
2122-19	E. T. Ford Cave City.	Same	
2122-19	Solzman & Co. Greenville.	Same	
2122-21	J. A. Allen Bloomfield.	Same	
781-19	Shaw & Reynolds Cave City.	Decorticated cotton seed	
1084-19	Shelby Co. F. & Gr. Co. Shelbyville.	Cotton seed	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot	Fat	Fiber
3035-18	Prime Cotton Seed	E. L. Gross & Co.	40.13	6.83	12.50
		Louisville, Ky.	38.62	6.00	12.00
477-18	“Forfat Brand” Cotton Seed Meal	Humphreys-Godwin Co.	39.44	6.72	11.73
		Memphis, Tenn.	38.62	6.00	12.00
1024-19	Memphis Brand Cotton Seed Meal	L. B. Lovitt & Co.	39.13	7.95	11.54
		Memphis, Tenn.	38.62	5.50	12.00
332-19	“Eagle Brand” Cotton Seed Meal	C. L. Montgomery & Co.	37.69	7.78	13.93
		Memphis, Tenn.	38.62	6.00	12.00
	36% Cotton Seed Feed				
2318-18	“Jay Brand” Cotton Seed Feed	F. W. Brode & Co.	46.38	8.23	6.20
		Memphis, Tenn.	36.00	5.00	14.00
2318-18	Same	Same	36.13	7.32	15.48
			36.00	5.00	14.00
2126-18	“Buckeye” Good Cotton Seed Feed	The Buckeye Cotton Oil Co.	36.06	6.02	15.05
		Cincinnati, Ohio.	36.00	5.00	14.00
2126-18	Same	Same	39.44	8.35	8.95
			36.00	5.00	14.00
800-19	Same	Same	37.06	7.33	12.10
			36.00	5.00	14.00
800-19	Same	Same	33.88	7.84	12.45
			36.00	5.00	14.00
800-19	Same	Same	34.50	7.72	12.65
			36.00	5.00	14.00
800-19	Same	Same	38.75	7.80	10.44
			36.00	5.00	14.00
800-19	Same	Same	47.75	7.96	6.88
			36.00	5.00	14.00
850-19	Cotton Seed Feed	Chattanooga Feed Co.	37.56	6.82	11.98
		Chattanooga, Tenn.	36.00	5.50	14.00
3066-18	Same	Same	38.38	6.37	10.38
			36.00	5.50	14.00
431-20	Cotton Seed Feed 36%	The Cincinnati Gr. & Hay Co.	39.00	7.33	13.30
		Covington, Ky.	36.00	5.50	14.00
1420-19	Good Cotton Seed Feed	The Cotton Seed Products Co.	37.25	6.28	15.28
		Louisville, Ky.	36.00	6.00	14.00
1420-19	Same	Same	37.50	6.07	15.78
			36.00	6.00	14.00
1420-20	Same	Same	37.13	6.57	13.43
			36.00	6.00	14.00
2710-20	Diamond Brand Cotton Seed Feed	Diamond Mills	35.75	6.54	12.23
		Evansville, Ind.	36.00	5.00	16.00
1085-19	“Arrow Good” Cotton Seed Feed	Edinger & Co.	35.94	6.04	13.43
		Louisville, Ky.	36.00	6.00	14.00
1085 19	Same	Same	35.19	5.23	16.20
			36.00	6.00	14.00

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
3035-18	Shelby Co. F. & Gr. Co. Shelbyville.	Cotton seed	
477-18	J. S. Bunnell Horse Cave.	Pressed cotton seed	
1024-19	Logan & Haggin Georgetown.	Cotton seed meal	
332-19	Marion Milling Co. Marion.	Cotton seed	Below guaranty in protein and above in fiber. Excess of lint present.
2318-18	Oscar Farmer & Sons Louisville.	Cotton seed meal, cotton seed hulls 30%	
2318-18	McKeel & Thurmond Murray.	Same	Above guaranty in fiber.
2126-18	1st Ky. District Sup. Co. Glasgow.	Cotton seed meal, cotton seed hulls 20%	Same.
2126-18	McCauley & Cain Versailles.	Same	
800-19	R. A. Dodd Nicholasville.	Cotton seed meal, cotton seed hulls 26%	
800-19	W. T. Sistrunk & Co. Lexington.	Same	Low in protein.
800-19	Same	Same	Below guaranty in protein. Excess of hulls.
800-19	Geo. P. Taylor Co. Burnside.	Same	
800-19	Kentucky Holstein Farm Bardstown.	Same	
850-19	Geo. P. Taylor Co. Burnside.	Cotton seed meal, cotton seed hulls 20%	
3066-18	Same	Cotton seed meal, cotton seed hulls 20.2%	
431-20	Berea College Dairy Berea.	Cotton seed meal, cotton seed hulls 24%	
1420-19	A. L. & W. C. Holt Bloomfield.	Cotton seed meal, cotton seed hulls 20%	Above guaranty in fiber.
1420-19	Borders & Clay Catlettsburg.	Same	Above guaranty in fiber.
1420-20	Climax Roller Mills Shelbyville.	Same	
2710-20	S. C. Jennings Madisonville.	Cotton seed meal, cotton seed hulls 30%	
1085-19	R. B. Hayes & Co. Hodgenville.	Cotton seed meal, cotton seed hulls 20%	Below guaranty in protein and above guarantee in fiber.
1085-19	Shelby Co. F. & Gr. Co. Shelbyville.	Same	Below guaranty in protein and fat and above in fiber.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1085-19	"Arrow Good" Cotton Seed Feed	Edinger & Co.	37.63	8.38	13.86
		Louisville, Ky.	36.00	6.00	14.00
1085-19	Same	Same	39.63	7.98	11.33
			36.00	6.00	14.00
135-19	Nutritia Cotton Seed Feed	The Eikenberry-Fitzgerald Co.	31.06	10.24	20.98
		Cincinnati, Ohio.	36.00	5.00	14.00
2976-18	Good Cotton Seed Feed	E. L. Gross & Co.	32.06	6.35	16.45
		Louisville, Ky.	36.00	5.00	14.00
2976-18	Same	Same	35.50	7.00	13.00
			36.00	5.00	14.00
2976-18	Same	Same	35.88	7.18	13.93
			36.00	5.00	14.00
2534-17	Danish Brand Cotton Seed Feed	Humphreys-Godwin Co.	35.50	6.95	11.60
		Memphis, Tenn.	36.00	4.50	16.00
970-19	Same	Same	34.31	6.45	15.68
			36.00	4.50	16.00
970-19	Same	Same	38.44	6.82	12.00
			36.00	4.50	16.00
970-19	Same	Same	35.31	6.45	14.70
			36.00	4.50	16.00
970-19	Same	Same	36.25	6.20	16.24
			36.00	4.50	16.00
970-19	Same	Same	36.13	6.33	14.45
			36.00	4.50	16.00
970-20	Same	Same	35.88	7.19	13.43
			36.00	4.50	16.00
800-19	Cotton Seed Feed	George Keller	37.88	6.51	13.15
		Newport, Ky.	36.00	5.00	14.00
2238-18	"Holstein Brand" Good Cotton Seed Feed	Lanier Bros.	40.38	7.15	11.61
		Nashville, Tenn.	36.00	5.00	14.00
3090-20	Same	Same	37.50	6.84	11.23
			36.00	5.00	14.00
3090-20	Same	Same	35.38	5.82	16.43
			36.00	5.00	14.00
1183-19	"Peace Brand" Cotton Seed Feed	Memphis Cot. Hull & Fiber Co.	33.94	6.31	16.88
		Memphis, Tenn.	36.00	5.50	14.00
2699-18	"Star Brand" Cotton Seed Feed	C. L. Montgomery & Co.	37.06	7.90	14.53
		Memphis, Tenn.	36.00	6.00	14.00
2621-20	Same	Same	36.50	5.72	12.34
			36.00	5.00	14.00
135-20	"Nutritia" Cotton Seed Feed	The Nutritia Co.	35.50	8.05	12.22
		Cincinnati, Ohio.	36.00	5.00	14.00
554-20	Economy Cotton Seed Feed	Southern Seed Co.	37.38	6.16	15.60
		Louisville, Ky.	36.00	5.00	14.00
2128-19	Success Brand Cotton Seed Feed	Tri-State Products Co.	33.50	7.06	16.65
		Memphis, Tenn.	36.00	5.50	14.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1085-19	Anderson F. & Seed Co. Lawrenceburg.	Cotton seed meal, cotton seed hulls 20%	
1085-19	Shelby Co. F. & Gr. Co. Shelbyville.	Same	
135-19	R. A. Jones Williamsburg.	Same	Very dark color. Below guaranty in protein and above guarantee in fiber.
2976-18	J. S. Beard Bardstown.	Same	Below guaranty in protein and above guaranty in fiber.
2976-18	Hudson, Hughes & Farnan, Lancaster.	Same	
2976-18	J. B. Polk Taylorsville.	Same	
2534-17	Same	Same	
970-19	J. W. Collins Woodlawn.	Same	Below guaranty in protein.
970-19	C. L. Jewell Horse Cave.	Same	
970-19	Am. Cooperative Assoc. Owensboro.	Same	Below guaranty in protein.
970-19	C. S. Brent & Bro Paris.	Same	
970-19	Same	Same	
970-20	Monarch Milling Co. Mt. Sterling.	Same	
800-19	Mfrs. Warehouse	Cotton seed meal, cotton seed hulls 26%	
2238-18	Cleveland & Co. Versailles.	Cotton seed meal, cotton seed hulls 20%	
3090-20	McKeel & Co. Murray.	Same	
3090-20	Farmers Milling Co. Tomkinsville.	Same	Contains an excess of hulls. Below guarantee in protein and above guaranty in fiber.
1183-19	Southern Seed Co. Louisville.	Same	Below guaranty in protein and above guaranty in fiber.
2699-18	Marion Milling Co. Marion.	Same	Above guaranty in fiber.
2621-20	Rucker Royalty Co. Lawrenceburg.	Cotton seed meal, cotton seed hulls 25%	
135-20	M. F. Flannery Augusta.	Cotton seed meal, cotton seed hulls 20%	
554-20	J. T. Lawrence Brodhead.	Same	Above guaranty in fiber.
2128-19	M. J. Yopp Seed Co. Paducah.	Same	Contains an excess of hulls. Below guaranty in protein and above guaranty in fiber.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
	20% Cotton Seed Feed				
......	"Monarch Brand" Cotton Seed Feed	Monarch Mills	16.75	2.75	28.90
		Chattanooga, Tenn.	20.00	3.50	22.00
550-19	Atlas Cotton Seed Feed	Southern Seed Co.	17.75	3.40	25.58
		Louisville, Ky.	20.00	3.00	26.00
550-19	Same	Same	24.63	4.01	21.60
			20.00	3.00	26.00
2239-19	"Alabama Brand" Cotton Seed Feed	Steele-Kolb By-Products Co.	18.88	3.95	24.04
		Birmingham, Ala.	20.00	3.20	24.00
725-18	Creamo Brand Cotton Seed Feed	Tennessee Fiber Co.	19.75	3.90	27.23
		Memphis, Tenn.	20.00	4.50	22.00
725-18	Same	Same	21.75	4.10	27.05
			20.00	4.50	22.00
	Ground Oats				
2171-19	Rolled Oats	The Early & Daniel Co.	13.00	5.47	9.53
		Cincinnati, Ohio.	11.00	4.00	12.00
1781-19	Ground Oats	Same	12.88	4.77	11.82
			10.50	4.00	11.50
1781-19	Same	Same	12.63	4.80	11.76
			10.50	4.00	11.50
2848-20	Crimped Oats	Eminence Milling Co.	12.00	5.09	11.00
		Eminence, Ky.	11.19	4.10	11.25
2784-20	Crushed Oats	Latonia Hay & Grain Co.	12.38	5.92	10.31
		Latonia, Ky.	11.25	4.25	11.00
2808-20	Ground Oats	Edw. M. Riedling	12.00	5.35	10.13
		Louisville, Ky.	12.00	4.50	10.00
1993-19	Vitality Ground Oats	Rosenbaum Bros.	10.50	5.43	11.13
		Chicago, Ill.	10.00	4.25	12.00
1993-19	Same	Same	11.75	4.89	13.11
			10.00	4.25	12.00
	Oil Meal				
395-19	Amco Old Process Linseed Meal & Old Process Screen'gs Oil Feed	American Milling Co.	31.63	6.09	9.75
		Peoria, Ill.	30.00	5.00	10.00
432-19	Oil Meal	Cincinnati Grain & Hay Co.	30.50	7.22	8.98
		Covington, Ky.	32.00	7.50	9.00
432-19	Same	Same	31.38	7.95	9.04
			32.00	7.50	9.00
432-20	Same	Same	32.13	7.44	9.05
			32.00	7.50	9.00
586-19	Oil Meal	The Early & Daniel Co.	30.94	7.25	8.63
		Cincinnati, Ohio.	30.00	5.00	10.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
......	Pulaski County Mill Co.. Somerset.	High grade cotton seed meal, bolted cotton seed hulls, bran.	Below guaranty in protein and fat and above in fiber.
550-19	LaGrange F. & Gr. Co... LaGrange.	Cotton seed meal, cotton seed hulls 45%	Below guaranty in protein. Dark color.
550-19	Fortney & Pulley....... Central City.	Same	
2239-19	H. P. Hawkins and Sons Paducah.	Prime cotton seed meal, ground cotton seed hulls 60%	Below guaranty in protein.
725-18	Harris & Crowder...... Franklin.	Choice cotton seed meal, cotton seed hulls 50%	Below guaranty in fat and above in fiber. Excess of finely ground hulls.
725-18	E. A. Cohen............ Greenville.	Same	Above guaranty in fiber. Excess of cotton seed hulls.
2171-19	LaGrange F. & Gr. Co... LaGrange.	Oats	
1781-19	Ky. River Coal & F. Co. Irvine.	Whole ground oats	
1781-19	J. H. Johnson.......... Jackson.	Same	
2848-20	Mfrs. Warehouse	Whole oats, crimped	
2784-20	Same	Whole oats, crushed	
2808-20	Same	Oats	
1993-19	Edw. M. Riedling....... Louisville.	Same	
1993-19	Same	Same	Above guaranty in fiber
395-19	Louisville Hay & Gr. Co. Louisville.	Linseed meal, screenings oil feed	
432-19	Elmendorf Coal & F. Co. Lexington.	Flaxseed	Below guaranty in protein.
432-19	Berea College Dairy.... Berea.	Same	Below guaranty in protein.
432-20	Harry Hartke.......... Covington.	Same	
586-19	LaGrange F. & Gr. Co... LaGrange.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
586-19	Oil Meal	The Early & Daniel Co.	30.63	7.34	8.89
		Cincinnati, Ohio.	30.00	5.00	10.00
586-20	Old Process Oil Meal	Same	30.63	6.29	9.13
			30.00	5.00	10.00
586-20	Same	Same	30.00	7.71	8.99
			30.00	5.00	10.00
615-09	Oil Meal	Edinger & Co.	34.13	7.15	9.78
		Louisville, Ky.	32.00	6.02	....
2343-17	Midland Brand Pure Oil Process Ground Linseed Cake	Midland Linseed Products Co.	31.25	7.70	9.16
		Minneapolis, Minn.	32.00	5.00	9.50
2343-17	Same	Same	30.75	7.51	10.12
			32.00	5.00	9.50
2343-17	Same	Same	31.75	5.72	9.05
			32.00	5.00	9.50
679-17	S. W. C. Linseed Oil Meal	The Sherwin-Williams Co.	36.69	7.73	8.05
		Cleveland, Ohio.	33.00	6.00	8.00
1802-19	Same	Same	37.06	7.53	8.53
			33.00	5.00	8.00
1634-19	"Major Brand" Linseed Oil Meal	Toledo Seed & Oil Co.	35.25	6.38	8.78
		Toledo, Ohio.	33.00	6.00	10.00
1399-20	Old Process Oil Meal	Same	35.75	6.69	8.25
			31.00	6.00	10.00
	Peanut Meal				
801-19	Unshelled Peanut Oil Feed	The Buckeye Cotton Oil Co.	31.44	6.15	30.33
		Cincinnati, Ohio.	30.00	6.00	22.00
52-19	Daisy Brand Peanut Feed	Lyle & Lyle	26.75	4.85	34.90
		Huntsville, Ala.	30.00	6.00	25.00
2817-20	"Little Coon Brand" Peanut Oil Cake Meal	Steele By-Products Co.	26.75	4.90	37.03
		Birmingham, Ala.	30.00	6.00	25.00
	Rice Bran				
3017-20	Rice Bran	Edinger & Co.	12.25	12.49	12.18
		Louisville, Ky.	12.00	12.00	12.00
1304-19	Same	Aubrey & Co.	13.00	13.55	14.70
		Louisville, Ky.	11.00	12.00	10.00
	Rye Middlings				
1720-19	Rye Middlings	Cincinnati Grain & Hay Co.	16.75	3.89	6.65
		Covington, Ky.	12.12	2.15	2.48
1720-19	Same	Same	16.38	4.10	7.85
			12.12	2.15	2.48
1943-19	Rye Middlings	The Early & Daniel Co.	16 75	3.29	3.22
		Cincinnati, Ohio.	14.00	3.00	6.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
586-19	Crab Orchard Milling Co. Crab Orchard.	Flaxseed	
586-20	Elmendorf Coal & F. Co. Lexington.	Same	
586-20	LaGrange F. & Gr. Co.. LaGrange.	Same	
615-09	M. Woosley & Son...... Elizabethtown.	Same	
2343-17	Kentucky F. & Gr. Co.. Louisville.	Same	Below guaranty in protein.
2343-17	Oscar Farmer & Sons... Louisville.	Same	Below guaranty in protein and above in fiber.
2343-17	Kahmann & Rehkamp... Covington.	Same	
679-17	H. E. Fisher.......... Wilmore.	Linseed meal	
1802-19	M. C. Marion Co. & Son. Elizabethtown.	Same	Above guaranty in fiber.
1634-19	Kentucky Holstein Farm Bardstown.	Flaxseed	
1399-20	Crab Orchard Milling Co. Crab Orchard.	Same	
801-19	R. L. Hardy........... Russellville.	Peanut meal, ground peanut hulls 20%.	Above guaranty in fiber.
52-19	G. B. Cooper & Co....... Adairville.	Peanut meal, peanut hulls 35%..	Below guaranty in both protein and fat and above in fiber.
2817-20	W. L. Kimbrough....... Guthrie.	Peanut meal, peanut hulls 50%.	Below guaranty in protein and fat and above in fiber. Adulterated with an excess of peanut hulls.
3017-20	Shelby Co. F. & Gr. Co. Shelbyville.	Rice bran	
1304-19	W. E. Ellis........... Hartford.	Same	Above guaranty in fiber. Rice hulls present.
1720-19	Witt & Alexander...... Irvine.	Rye	Above guaranty in fiber. Excess of rye bran. Ground and unground weed seeds, wild buckwheat, mustard and pigeon grass present.
1720-19	Canada & Claunch...... Somerset.	Same	Above guaranty in fiber. contains rye bran and weed seeds.
1943-19	Taulbee & Co.......... Hazard.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
885-19	Rye Middlings and Screenings...	B. A. Eckhart Milling Co....	16.38	3.60	5.42
		Chicago, Ill.	14.50	3.00	7.00
1940-19	Rye Middlings and Screenings....	T. G. Jewett & Sons........	17.38	3.57	6.11
		Portsmouth, Ohio.	14.85	4.50	11.00
3319-21	Rye Middlings	F. W. Kibler Milling Co.....	15.75	3.35	5.53
		Mt. Orab, Ohio.	14.50	3.00	7.00
2426-20	True Value Pure Rye Middlings..	Ladish Milling Co...........	15.88	3.67	5.20
		Milwaukee, Wis.	13.50	3.00	3.50
1563-19	"Snowflake" Rye Middlings.....	Lawrenceburg Roller Mills Co.	16.50	3.68	5.85
		Lawrenceburg, Ind.	14.00	3.00	6.00
140-20	"Nutritia" Rye Middlings and Screenings	The Nutritia Co.............	13.00	2.44	6.79
		Cincinnati, Ohio.	15.50	3.00	3.50
353-19	Pillsbury's Rye Middlings and Screenings	Pillsbury Flour Mills Co.....	17.00	3.55	5.83
		Minneapolis, Minn.	15.00	2.50	9.00
1605-19	Rye Middlings and Screenings....	M. G. Rankin & Co..........	16.13	4.25	7.36
		Milwaukee, Wis.	14.00	3.00	6.00
1605-19	Same	Same	17.00	3.44	2.91
			14.00	3.00	6.00
	Rye Mixed Feed				
2725-18	Rye Mixed Feed and Screenings..	Akin-Erskine Milling Co.....	15.75	2.83	3.90
		Evansville, Ind.	14.50	3.00	11.00
2228-19	Rob Roy Rye Feed.............	Wm. A. Coombs Millings Co..	15.00	3.57	4.78
		Coldwater, Mich.	15.66	2.95	6.00
	Wheat Bran				
1646-19	Wheat Bran and Screenings......	Aubrey Hall & Co...........	17.63	4.44	10.77
		Louisville, Ky.	14.50	3.70	9.50
1923-19	Wheat Bran	Caudill Hall & Co...........	16.75	3.99	7.45
		Morehead, Ky.	15.25	4.20	8.75
1241-20	Wheat Bran	Cincinnati Grain & Hay Co...	15.63	4.52	10.75
		Covington, Ky.	15.00	4.00	9.08
1533-19	Wheat Bran	The Colton Bros. Co.........	16.75	4.30	9.51
		Bellefontaine, Ohio.	14.50	4.00	9.50
1954-20	Dreyer Commission Co.'s Wheat Bran and Screenings	Dreyer Commission Co.......	16.00	4.39	9.35
		St. Louis, Mo.	14.50	3.50	10.00
588-19	Wheat Bran	The Early & Daniel Co.......	16.88	4.56	10.90
		Cincinnati, Ohio.	14.00	3.00	11.00
588-20	Same	Same	17.75	4.21	8.97
			14.50	3.00	10.00
1094-20	Wheat Bran and Screenings......	Edinger & Co...............	17.00	4.29	9.30
		Louisville, Ky.	15.00	3.00	10.00
2045-19	Wheat Bran and Screenings......	J. H. Fedders & Sons........	17.00	4.94	11.10
		Covington, Ky.	15.25	4.17	8.25

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
885-19	R. M. Harrison & Son Maysville.	Rye middlings, recleaned ground rye screenings 5%	
1940-19	R. W. McKee Greenup.	Rye middlings, ground rye screenings 15%	Below guaranty in fat. Corn screenings present.
3319-21	R. M. Harrison & Son Maysville.	Rye middlings	Contains foreign matter.
2426-20	London Grocery Co. London.	Rye	Above guaranty in fiber.
1563-19	A. Schneider Sons Louisville.	Pure rye product, ground rye screenings 5%	
140-20	Jessamine F., C. & Sup. Co., Nicholasville.	Rye middlings, ground rye screenings 3%	Above guaranty in fiber. Product is ground barley containing ground oats. Below guaranty in protein and fat and above in fiber.
353-19	Lessenberry & Jones Glasgow.	Rye middlings, ground rye screenings 15%	
1605-19	Burg Kinner Greenup.	Same	Above guaranty in fiber. Contains a large per cent of rye bran.
1605-19	Greenup Milling Co. Grayson.	Same	
2725-18	J. J. Shaver Mayfield.	Rye bran, rye middlings, ground rye screenings 1%, salt 1%	
2228-19	R. M. Harrison & Son Maysville.	Rye bran, rye middlings, ground rye screenings 1%	Below guaranty in protein.
1646-19	J. R. Miller & Son Barbourville.	Wheat bran, ground wheat screenings 3%	Above guaranty in fiber.
1923-19	Mfrs. Warehouse	Pure wheat bran	Sample is mixed wheat feed containing screenings.
1241-20	The Mahan Co. Hazard.	Wheat	Contains unground wheat screenings. Above guaranty in fiber.
1533-19	W. P. Farley Co. Maysville.	Wheat bran	Wheat chaff present.
1954-20	Conrad J. Clausen Louisville.	Wheat bran, ground wheat screenings 8%	
588-19	I. F. Tabb Mt. Sterling.	Wheat bran	
588-20	F. K. Tribble Danville.	Wheat bran	
1094-20	Oren La Master Campbellsburg.	Wheat bran, ground wheat screenings 3%	
2045-19	Ben Dusing Covington.	Wheat, ground screenings 5%	Above guaranty in fiber.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1473-20	Wheat Bran and Screenings......	Fuhrer-Ford Milling Co......	17.88	4.65	9.38
		Mt. Vernon, Ind.	14.00	3.70	9.00
504-20	Pure Wheat Bran................	Igleheart Bros.	16.00	4.40	10.31
		Evansville, Ind.	14.50	4.00	10.00
1028-20	Wheat Bran and Screenings......	Louisville Milling Co.........	15.75	4.23	9.86
		Louisville, Ky.	14.50	4.00	9.50
1306-19	Wheat Bran and Screenings......	Oakland Milling Co..........	14.88	4.01	6.50
		Oakland, Ky.	15.25	4.00	9.25
1189-13	Bran	Orndorff & Chaney..........	15.69	4.62	6.45
		Adairville, Ky.	15.06	4.89	8.50
2550-20	Bran	Peoples Roller Mills........	16.50	4.55	8.43
		Sebree, Ky.	15.35	4.25	8.50
2550-20	Bran	Same	14.25	4.83	7.80
			15.35	4.25	8.50
2558-20	Wheat Bran and Screenings......	Poseyville Milling Co........	16.50	4.28	9.73
		Evansville, Ind.	14.50	3.70	9.50
1434-20	Wheat Bran	Richardson Milling Co......	17.00	3.86	7.13
		Horse Cave, Ky.	15.50	4.25	9.00
2374-20	Bran	Riverside Mills	16.00	4.32	10.88
		Adairville, Ky.	15.00	3.85	10.00
1995-19	Wheat Bran and Screenings......	R. D. Robertson............	16.75	4.28	10.40
		Mayfield, Ky.	14.50	3.50	10.00
555-19	Economy Wheat Bran	Southern Seed Co............	18.75	4.50	9.38
		Louisville, Ky.	14.50	4.00	9.50
1200-19	Bran	The Southwestern Milling Co.	17.00	4.37	10.36
		Kansas City, Mo.	14.00	3.50	12.50
566-19	Valier's Wheat Bran and Screenings	Valier & Spies Milling Co....	18.25	4.95	9.80
		St. Louis, Mo.	14.50	3.50	10.00
566-19	Same	Same	16.50	4.60	9.90
			14.50	3.50	10.00
566-19	Same	Same	17.00	5.04	8.31
			14.50	3.50	10.00
	Shorts and Middlings				
301-19	Acme Middlings and Screenings..	Acme-Evans Co..............	16.75	4.40	8.47
		Indianapolis, Ind.	16.50	4.50	8.00
301-19	Same	Same	17.88	4.61	7.45
			16.50	4.50	8.00
301-19	Same	Same	17.25	5.13	7.12
			16.50	4.50	8.00
301-19	Same	Same	17.25	4.22	8.50
			16.50	4.50	8.00
1196-19	Big X Middlings and Screenings..	Acme-Jones Co...............	18.38	6.88	10.20
		Louisville, Ky.	16.00	4.00	10.00
1303-20	Same	Same	17.13	5.01	9.50
			14.00	4.00	11.00
1881-19	Special Middlings	Same	15.00	3.57	8.48
			15.50	4.00	9.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1473-20	F. H. Vogle Henderson.	Wheat bran, ground wheat screenings 8½%	
504-20	H. P. Hawkins & Sons Paducah.	Winter wheat bran	
1028-20	Elmendorf Coal & F. Co. Lexington.	Wheat bran, ground wheat screenings 1%	
1306-19	J. J. Dobson Bowling Green.	Wheat bran, ground wheat screenings 17%	
1189-13	Mfrs. Warehouse	Wheat	
2550-20	A. Niswonger Providence.	Wheat bran	
2550-20	Same	Same	Below guaranty in protein. Adulterated with corn bran and corn meal.
2558-20	T. F. Hart Henderson.	Wheat bran, ground wheat screenings 1%	
1434-20	Mfrs. Warehouse	Wheat bran	
2374-20	Knob City Mills Russellville.	Wheat bran	Above guaranty in fiber.
1995-19	Mfrs. Warehouse	Wheat bran, ground wheat screenings 10%	
555-19	C. M. Langdon Science Hill.	Wheat bran, ground wheat screenings 3%	
1200-19	Johnson Bros. Benton.	Pure wheat bran	
566-19	J. J. Shaver Mayfield.	Wheat bran, ground wheat screenings 4%	
566-19	Covington Bros. & Co. Murray.	Same	
566-19	Allen County Farm Bur. Scottsville.	Same	
301-19	Stearns Coal & Lum. Co. Stearns.	Wheat middlings, ground wheat screenings 5%	
301-19	Sharp & McCreary Corbin.	Same	
301-19	Same	Same	
301-19	Elkhorn Coal Corp. Fleming.	Same	Excess of ground wheat bran.
1196-19	Ky. River Coal & F. Co. Irvine.	Wheat middlings, ground wheat screenings 5%	Adulterated with ground weed seeds.
1303-20	Conrad J. Clausen Louisville.	Wheat middlings, ground wheat screenings 15%	
1881-19	D. Scott Auburn.	Wheat middlings	Sample is mixed wheat feed composed of bran and middlings.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1881-19	Special Middlings	Acme-Jones Co.	15.75	4.60	7.25
		Louisville, Ky.	**15.50**	**4.00**	**9.00**
1881-19	Same	Same	17.13	4.17	7.25
			15.50	**4.00**	**9.00**
1881-19	Same	Same	15.25	3.98	7.60
			15.50	**4.00**	**9.00**
1881-19	Same	Same	16.50	4.30	7.58
			15.50	**4.00**	**9.00**
1973-20	Pure Wheat Shorts	The Acme Mills	17.75	4.95	7.96
		Hopkinsville, Ky.	**16.50**	**5.00**	**7.09**
746-19	Clover Leaf Shorts and Screenings	Akin-Erskine Milling Co.	17.00	3.95	6.48
		Evansville, Ind.	**14.00**	**4.00**	**6.00**
746-20	Same	Same	16.13	4.18	5.47
			16.00	**4.00**	**6.00**
746-20	Same	Same	15.38	3.47	5.11
			16.00	**4.00**	**6.00**
746-20	Same	Same	15.75	4.04	6.00
			16.00	**4.00**	**6.00**
746-20	Same	Same	16.00	3.83	5.95
			16.00	**4.00**	**6.00**
2680-20	A-1 Trojan Farm Feed	Allen & Wheeler Co.	17.00	3.92	6.45
		Troy, Ohio.	**16.00**	**4.00**	**6.00**
1005-18	William Tell Middlings and Screenings	The Ansted & Burk Co.	17.63	4.67	6.25
		Springfield, Ohio.	**14.50**	**4.00**	**7.50**
1005-18	Same	Same	17.00	4.54	5.35
			14.50	**4.00**	**7.50**
1648-19	Aubrey's Middlings and Screenings	Aubrey & Co.	17.38	5.51	9.20
		Louisville, Ky.	**16.50**	**5.04**	**7.50**
1648-19	Same	Same	16.88	5.57	8.00
			16.50	**5.04**	**7.50**
749-20	Shorts	Auburn Mills	16.88	4.53	7.00
		Auburn, Ky.	**16.25**	**4.50**	**6.50**
3099-20	Aunt Jemima Shorts	Aunt Jemima Mills Co.	17.38	4.34	5.85
		St. Joseph, Mo.	**16.00**	**3.50**	**7.50**
638-20	Ballard's Kentucky Farm Feed and Screenings	Ballard & Ballard Co.	17.25	3.92	5.63
		Louisville, Ky.	**16.00**	**4.00**	**6.50**
638-20	Same	Same	17.00	2.50	5.30
			16.00	**4.00**	**6.50**
288-18	‘‘Winona’’ Wheat Middlings and Screenings	Bay State Milling Co.	16.88	5.80	6.75
		Winona, Minn.	**16.50**	**5.00**	**8.30**
772-19	‘‘Bay State’’ Wheat Middlings and Screenings	Same	15.38	5.20	7.75
			15.90	**4.00**	**7.50**
772-19	Same	Same	16.50	4.96	7.80
			15.90	**4.00**	**7.50**
792-19	Middlings and Screenings	Bernett, Craft & Kauffman	19.13	5.23	6.05
		Milling Co., Mt. Carmel, Ill.	**17.25**	**4.95**	**6.00**
792-19	Same	Same	17.13	4.64	6.31
			17.25	**4.95**	**6.00**

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1881-19	Sam Nahm & Co., Bowling Green.	Wheat middlings	Sample is mixed wheat feed composed of bran and middlings.
1881-19	Smith-Chadwell & Co., Middlesboro.	Same	Same.
1881-19	Cole, Hughes & Co., Barbourville.	Same	Same.
1881-19	Jellico Grocery Co., Corbin.	Same	Same.
1973-20	T. M. Woolridge, Hopkinsville.	Wheat shorts	Above guaranty in fiber.
746-19	Sam Nahm & Co., Bowling Green.	Winter wheat shorts, ground wheat screenings 1%, salt 1%.	
746-20	J. H. Roberts, Fordsville.	Same	
746-20	St. Bernard Mining Co., Earlington.	Same	Below guaranty in protein and fat.
746-20	J. P. Summers, Smith's Grove.	Same	
746-20	Gray & Trent, Irvington.	Same	
2680-20	The Mahan Co., Hazard.	Wheat middlings, ground wheat screenings 3%	
1005-18	W. A. Fisher, Flemingsburg.	Wheat middlings, ground wheat screenings 2%	
1005-18	Ohio Valley Mill & Supply Co., Ashland.	Same	
1648-19	Wilson & Son, Russellville.	Wheat middlings, ground wheat screenings 3%	Above guaranty in fiber. Adulterated with wheat bran.
1648-19	A. D. Ashcraft, Irvington.	Same	Same.
749-20	C. D. Pottinger, South Union.	Wheat	
3099-20	Louisville H. & Gr. Co., Louisville.	Wheat shorts	
638-20	Powell-Hackney Groc. Co., Hazard.	Gray shorts, cleaned and ground wheat screenings 4½%	
638-20	J. A. Bennett, Taylorsville.	Same	Below guaranty in fat.
288-18	Ky. Wholesale Groc. Co., Pikeville.	Wheat middlings, ground wheat screenings 8%	
772-19	Latonia Hay & Gr. Co., Covington.	Wheat middlings, ground wheat screening 6¾%	Below guaranty in protein.
772-19	Park City Feed Store, Bowling Green.	Same	
792-19	Wathen Coal & Feed Co., Lebanon.	Wheat middlings, ground wheat screenings 5%	
792-19	Sam Nahm & Co., Bowling Green.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
792-19	Middlings and Screenings	Bernet, Craft & Kaufmann	17.38	4.75	7.12
		Milling Co., Mt. Carmel, Ill.	17.25	4.95	6.00
1934-19	Shipstuff	Blue Grass Milling Co.	15.50	3.55	5.71
		Campbellsburg, Ky.	15.75	4.46	3.50
624-20	Wheat Shorts	Bowling Green Milling Co.	16.56	4.54	5.45
		Bowling Green, Ky.	17.30	4.47	7.50
2700-20	Wheat Shorts	Bush & Pritchard	18.63	5.81	5.65
		Ashland, Ky.	16.50	4.50	7.50
361-19	Middlings and Screenings	Cannelton Flour Mills	15.38	3.96	4.60
		Cannelton, Ind.	16.25	4.18	9.00
1341-19	Poland Standard Wheat Middlings	The Century Milling Co.	18.13	4.18	7.45
	and Screenings	Minneapolis, Minn.	14.00	4.00	11.00
429-19	Wheat Middlings	Cincinnati Grain & Hay Co.	16.63	4.03	6.40
		Covington, Ky.	15.75	4.25	6.00
429-20	Same	Same	18.00	4.90	7.78
			15.75	4.25	6.00
429-20	Same	Same	16.25	4.58	7.99
			15.75	4.25	6.00
429-20	Same	Same	17.75	4.88	5.93
			16.00	4.25	6.00
429-20	Same	Same	17.75	4.73	7.13
			16.00	4.25	6.00
429-20	Same	Same	16.00	4.98	9.16
			16.00	4.25	6.00
2059-21	Soft Wheat Middlings and Screenings	H. C. Cole Milling Co.	16.75	4.35	6.75
		Chester, Ill.	16.00	4.00	6.00
1534-19	Wheat Middlings and Screenings.	The Colton Bros. Co.	16.63	5.21	6.20
		Bellefontaine, Ohio.	16.00	4.50	6.00
1534-19	Same	Same	18.13	4.93	5.90
			16.00	4.50	6.00
356-20	Wheat Middlings and Screenings.	Diamond Mills	18.25	5.04	8.02
		Evansville, Ind.	16.00	5.00	7.50
356-20	Same	Same	18.50	5.41	7.60
			16.00	5.00	7.50
356-21	Same	Same	16.00	4.28	6.20
			16.00	5.00	7.50
356-21	Same	Same	16.88	5.74	7.78
			16.00	5.00	7.50
356-21	Same	Same	16.25	4.77	10.27
			16.00	5.00	7.50
1955-19	Dreyer Commission Co.'s Wheat	Dreyer Commission Co.	17.88	4.31	6.30
	Middlings and Screenings	St. Louis, Mo.	15.00	4.00	8.00
1955-19	Same	Same	16.13	4.64	8.00
			15.00	4.00	8.00
1955-20	Same	Same	17.88	5.22	6.09
			16.00	4.00	7.50
1840-19	Standard Wheat Middlings and	Eagle Roller Mills Co.	17.25	5.10	8.69
	Screenings	New Ulm, Minn.	14.00	4.00	11.00

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
792-19	Simmons & McCutchen Bowling Green.	Wheat middlings, ground wheat screenings 5%	Above guaranty in fiber.
1934-19	Mfrs. Warehouse	Wheat bran, middlings	Below guaranty in fat and above in fiber.
624-20	Same	Wheat shorts	Below guaranty in protein.
2700-20	Same	Same	
361-19	A. D. Ashcraft Irvington.	Wheat middlings, ground wheat screenings 5%	Below guaranty in protein.
1341-19	C. L. Jewell Horse Cave.	Wheat middlings, ground wheat screenings 1½%	
429-19	Smith & Horton Grayson.	Wheat middlings	
429-20	Pulaski Co. Mill & Gr. Co. Somerset.	Same	Above guaranty in fiber.
429-20	Tyre, Siler & Co. Corbin.	Same	Same.
429-20	Geo. P. Taylor Co. Burnside.	Same	
429-20	Mfrs. Warehouse	Same	Above guaranty in fiber. Contains ground screenings.
429-20	Louis Trenkamp Covington.	Same	Above guarantee in fiber. Adulterated with ground wheat bran and screenings.
2059-21	R. D. Robertson Mayfield.	Soft winter wheat middlings, ground wheat screenings 7%	Above guaranty in fiber.
1534-19	The Arcade Store Barbourville.	Wheat middlings, ground wheat screenings 4%	
1534-19	W. P. Farley Co. Mayfield.	Same	
356-20	Amer. Cooperative Assoc. Fordsville.	Wheat middlings, ground wheat screenings 5%	Above guaranty in fiber.
356-20	Rea & Rice Earlington.	Same	
356-21	Layman Bros. Princeton.	Same	Below guaranty in fat.
356-21	B. Collins Dawson Springs.	Same	
356-21	E. E. Brown, Son & Co. Livermore.	Same	Above guaranty in fiber. Adulterated with wheat bran.
1955-19	J. W. Davis Elkton.	Wheat middlings, ground wheat screenings 8%	
1955-19	Henderson Feed Store Henderson.	Wheat, ground wheat screenings 8%	Same.
1955-20	J. W. Davis Elkton.	Wheat middlings, ground wheat screenings 8%	
1840-19	Grant North Salt Lick.	Standard wheat middlings, ground wheat screenings 1%	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1840-19	Standard Wheat Middlings and Screenings	Eagle Roller Mills Co.	16.25	4.84	9.23
		New Ulm, Minn.	14.00	4.00	11.00
582-20	Wheat Middlings	The Early & Daniel Co.	16.75	6.13	10.38
		Cincinnati, Ohio	16.00	3.00	7.00
582-20	Same	Same	16.50	4.41	8.61
			16.00	3.00	7.00
1162-19	Wheat Middlings and Screenings.	B. A. Eckhart Milling Co.	17.38	4.56	9.18
		Chicago, Ill.	14.50	4.00	7.00
1175-18	Wheat Middlings and Screenings.	Edinger & Co.	18.75	5.43	8.18
		Louisville, Ky.	16.00	4.00	7.50
1093-19	Same	Same	16.13	5.00	7.10
			16.00	4.00	7.50
1093-19	Same	Same	17.13	4.70	6.73
			16.00	4.00	7.50
1093-20	Wheat Middlings and Screenings.	Edinger & Co.	18.13	4.96	5.82
		Louisville, Ky.	16.00	4.00	7.50
141-19	"Nutritia" Winter Wheat Middlings and Screenings	The Eikenberry-Fitzgerald Co.	15.00	4.69	10.80
		Cincinnati, Ohio.	15.00	3.50	10.00
141-19	Same	Same	16.63	4.68	5.70
			15.00	3.50	10.00
2046-19	Middlings	J. H. Fedders & Sons	15.75	4.57	8.97
		Covington, Ky.	15.97	4.52	7.00
2046-20	Standard Middlings	Same	18.63	4.81	8.31
			16.00	4.52	7.50
356-19	Wheat Middlings and Screenings.	Fisher Bros.	17.13	5.25	10.55
		Evansville, Ind.	15.00	4.00	10.00
2060-19	Grey Shorts	Same	17.38	3.85	6.93
			16.00	5.00	10.00
2102-19	Wheat Middlings and Screenings.	The Franke Grain Co.	17.75	5.45	9.10
		Milwaukee, Wis.	14.00	4.50	10.00
1474-21	Winter Wheat Shorts	Fuhrer-Ford Milling Co.	16.25	4.68	5.67
		Mt. Vernon, Ind.	17.00	3.50	7.50
1484-20	Spring Wheat Shorts and Screenings	Edward F. Goeke Co.	16.75	4.95	8.36
		Evansville, Ind.	16.00	4.50	7.50
1484-20	Same	Same	16.00	4.34	7.03
			16.00	4.50	7.50
1484-21	Same	Same	16.81	5.73	6.28
			16.00	4.50	7.50
1611-19	Middlings	The Goldcamp Mill Co.	15.50	4.50	9.89
		Ironton, Ohio.	14.00	4.00	7.00
1316-19	Wheat Middlings and Screenings.	Gwinn Bros. & Co.	16.50	4.26	7.27
		Huntington, W. Va.	13.91	3.60	4.21
1316-19	Same	Same	17.25	3.81	4.97
			13.91	3.60	4.21
1316-20	Same	Same	13.38	5.15	7.35
			16.00	4.00	7.50

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1840-19	S. H. Tolliver Fleming.	Standard wheat middlings, ground wheat screenings 1%	Adulterated with wheat bran. Excess of screenings.
582-20	Taulbee & Co. Hazard.	Wheat middlings	Above guaranty in fiber. Adulterated with wheat bran, screenings and weed seeds.
582-20	Lewis Wholesale Co. Whitesburg.	Same	Above guaranty in fiber. Contains an excess of wheat bran, also ground screenings.
1162-19	Peoples Trading Co. Catlettsburg.	Wheat middlings, ground wheat screenings 5%	Above guaranty in fiber. Adulterated with wheat bran.
1175-18	R. B. Hayes & Co. Hodgenville.	Wheat middlings, ground wheat screenings 3%	Above guaranty in fiber.
1093-19	Simmons Feed Store Bowling Green.	Same	
1093-19	Shelby Co. F. & Gr. Co. Shelbyville.	Same	
1093-20	Smith & Jeffries Horse Cave.	Wheat middlings, ground wheat screenings 3%	
141-19	W. W. Broaddus & Co. Richmond.	Wheat middlings, ground wheat screenings 3%	Above guaranty in fiber.
141-19	W. P. Farley & Co. Maysville.	Same	
2046-19	Ruef Bros. Covington.	Wheat	Above guaranty in fiber. Sample is not middlings.
2046-20	C. W. Meyers Florence.	Same	Same.
356-19	Henry Paris. Marion.	Wheat middlings, ground wheat screenings 10%	Above guaranty in fiber. Excess wheat bran, wild buckwheat, pigeon grass and weed seeds present.
2060-19	J. J. Shaver Mayfield.	Wheat shorts, wheat screenings 4%	Below guaranty in fat.
2102-19	Staggs Bros. Vanceburg.	Wheat middlings, ground wheat screenings 15%	
1474-21	F. H. Vogle Henderson.	Winter wheat shorts	Below guaranty in protein.
1484-20	Fortney & Pulley Central City.	Springs wheat shorts, ground wheat screenings 3%	Above guaranty in fiber. Adulterated with ground wheat bran.
1484-20	Henderson F. & Com. Co. Henderson.	Same	
1484-21	J. W. Page Mortonsville.	Same	
1611-19	Copley Ward & Preston. Paintsville.	Wheat middlings	Above guaranty in fiber. Adulterated with ground wheat bran.
1316-19	Robt. Williams Pikeville.	Wheat middlings, ground wheat screenings 2%	Above guaranty in fiber.
1316-19	Same	Same	Same.
1316-20	Williams Feed Co. Pikeville.	Same	Below guaranty in protein. Adulterated with corn bran. Inferior to guaranty.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1316-20	Wheat Middlings and Screenings.	Gwinn Bros. & Co.	15.56	5.00	9.20
		Huntington, W. Va.	16.00	4.00	7.50
1316-20	Same	Same	15.38	4.76	6.98
			16.00	4.00	7.50
1237-19	Wheat Middlings	P. H. Harsha	18.25	4.70	6.05
		Portsmouth, Ohio.	14.68	3.34	5.66
1237-21	Same	Same	16.50	4.64	8.03
			18.80	5.20	5.80
1828-19	Wheat Middlings and Screenings	H. P. Hawkins & Sons	17.25	4.53	7.50
		Paducah, Ky.	16.00	4.00	9.00
1828-21	Same	Same	15.88	4.15	7.35
			16.00	4.00	7.50
1230-20	H. C. Co. Wheat Middlings and Screenings	Herndon Carter Co.	16.50	4.97	7.19
		Louisville, Ky.	16.00	4.00	7.50
1230-20	Same	Same	17.63	5.32	8.20
			16.00	4.00	7.50
1230-20	Same	Same	16.25	5.60	8.17
			16.00	4.00	7.50
760-19	Middlings and Screenings	Hopkinsville Milling Co.	16.88	4.66	10.03
		Hopkinsville, Ky.	15.44	3.83	7.05
760-19	Same	Same	17.38	4.57	9.17
			15.44	3.83	7.05
760-21	Same	Same	16.06	4.26	8.50
			16.00	3.83	7.05
505-19	Pure Wheat Middlings	Igleheart Bros.	17.75	4.96	7.00
		Evansville, Ind.	16.00	5.00	7.00
505-20	Same	Same	18.00	4.52	6.84
			16.00	5.00	7.00
505-20	Same	Same	15.63	4.81	6.67
			16.00	5.00	7.00
505-20	Pure Wheat Middlings	Igleheart Bros.	16.00	4.24	7.75
		Evansville, Ind.	16.00	5.00	7.00
505-20	Same	Same	16.38	4.93	7.75
			16.00	5.00	7.00
505-21	Same	Same	16.63	4.66	7.38
			16.00	5.00	7.00
1825-19	Wheat Middlings and Screenings	T. G. Jewett & Sons	17.88	4.99	8.61
		Portsmouth, Ohio.	14.00	4.00	11.00
1825-20	Same	Same	15.88	4.69	9.27
			16.00	4.00	7.50
488-19	Rex Middlings and Screenings	Kehlor Flour Mills Co.	17.25	4.06	7.70
		St. Louis, Mo.	16.00	4.00	7.00
2344-20	Illmo Middlings and Screenings	Same	16.75	3.30	5.58
			17.00	4.00	4.00
2305-19	Fancy White Middlings	Keister Milling Co.	15.00	3.92	6.36
		Huntington, W. Va	16.00	5.00	4.00
2305-20	Same	Same	15.25	4.29	4.99
			16.00	5.00	4.00

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1316-20	Kentucky Wholesale Gr. Co., Pikeville.	Wheat middlings, ground wheat screenings 2%	Below guaranty in protein and high in fiber. Adulterated with ground wheat bran.
1316-20	Same	Same	Below guaranty in protein.
1237-19	H. H. Fitzpatrick Prestonburg.	Wheat middlings	
1237-21	Pure Food Grocery Co. Prestonburg.	Same	Below guaranty in protein and fat and above in fiber. Adulterated with wheat bran and screenings.
1828-19	McKeel & Thurmond Murray.	Wheat middlings, ground wheat screenings 5%	
1828-21	McKeel & Co. Murray.	Same	
1230-20	Cole, Hughes & Co. Barboursville.	Wheat middlings, ground wheat screenings 7%	
1230-20	J. A. Reid & Co. New Hope.	Same	Above guaranty in fiber. Sample is mixed wheat feed.
1230-20	Gray & Trent Irvington.	Same	Above guaranty in fiber. Excess of ground wheat bran.
760-19	W. A. Chambers Co. Russellville.	Wheat middlings, ground wheat screenings 4%	Above guaranty in fiber. Adulterated with ground wheat bran.
760-19	Rice Grocery Co. Hopkinsville.	Same	Same.
760-21	J. G. Greshan Hopkinsville.	Same	Same.
505-19	Doon Bros. Kuttawa.	Winter wheat middlings	
505-20	E. P. Barnes & Bros. Beaver Dam.	Same	
505-20	W. A. Chambers Co. Russellville.	Same	Below guaranty in protein.
505-20	Marion Milling Co. Marion.	Winter Wheat Middlings	Above guaranty in fiber and below in fat. Contains ground wheat screenings.
505-20	Scottsville Produce Co. Scottsville.	Same	Above guaranty in fiber. Contains wheat bran and screenings.
505-21	W. L. Kimbrough Guthrie.	Same	
1825-19	Banner Produce Co. Greenup.	Wheat Middlings, Ground Wheat Screenings 15%	Adulterated with wheat bran.
1825-20	Staggs Bros. & Co. Vanceburg.	Same	Above guaranty in fiber. Adulterated with wheat bran.
488-19	Covington Bros. & Co. Murray.	Pure Wheat Middlings, Ground Wheat Screenings 8%	Above guaranty in fiber.
2344-20	Same	Flour Wheat Middlings, Ground Wheat Screenings 8%	Below guaranty in fat and above in fiber.
2305-19	The O. H. Stumbo Co. Prestonburg.	Wheat Middlings, Low Grade Flour	Below guaranty in protein and fat and above in fiber.
2305-20	Williams Feed Co. Pikeville.	Same	Below guaranty in protein and fat and above in fiber. Ground wheat screenings and corn meal present.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2305-20	Fancy White Middlings	Keister Milling Co.	11.50	3.63	6.38
		Huntington, W. Va.	16.00	5.00	4.00
2305-21	Same	Same	11.38	4.88	6.25
			16.00	5.00	4.00
2305-21	Same	Same	11.38	4.45	7.13
			16.00	5.00	4.00
2305-21	Same	Same	11.63	5.15	7.50
			16.00	5.00	4.00
194-20	Middlings and Screenings	Geo. Keller	16.13	4.52	7.08
		Newport.	16.00	3.50	7.50
1334-19	Wheat Middlings	The Kenton Hay & Grain Co.	16.88	4.88	8.05
		Latonia, Ky.	15.75	4.25	6.00
1572-20	Success Middlings	Kentucky Feed & Grain Co.	18.38	4.38	6.61
		Louisville, Ky.	16.00	4.50	6.00
2296-20	Wheat Middlings	Wm. H. Kramer	16.00	3.99	6.45
		Cincinnati, Ohio.	16.00	3.50	7.50
1830-15	Wheat Middlings	Latonia Hay & Grain Co.	16.50	4.92	8.12
		Latonia, Ky.	16.00	4.50	5.25
1029-19	Wheat Shorts and Screenings	Louisville Milling Co.	17.00	3.95	7.83
		Louisville, Ky.	15.00	4.00	7.00
1029-19	Same	Same	16.25	3.85	8.10
			15.00	4.00	7.00
1029-19	Same	Same	17.63	4.36	9.60
			15.00	4.00	7.00
1029-19	Same	Same	17.75	4.02	7.65
			15.00	4.00	7.00
1029-19	Same	Same	16.25	3.72	8.24
			15.00	4.00	7.00
1029-20	Same	Same	17.00	3.61	9.20
			16.00	4.00	7.00
1029-20	Same	Same	16.75	4.13	8.87
			16.00	4.00	7.00
1029-20	Same	Same	16.50	4.09	8.82
			15.00	4.00	7.00
1029-21	Same	Same	16.13	4.25	8.35
			16.00	4.00	7.00
1029-21	Same	Same	16.81	4.25	8.45
			16.00	4.00	7.00
3057-20	Wheat Middlings	J. E. Lynd	17.50	5.35	6.88
		Russell, Ky.	16.25	4.25	7.50
1057-19	Money Maker Wheat Middlings	The Mansfield Milling Co.	18.00	5.02	6.03
	and Screenings	Mansfield, Ohio.	15.00	4.00	8.00
1057-20	Same	Same	17.00	4.64	7.36
			16.00	4.00	7.50

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2305-20	The O. H. Stumbo Co... Prestonburg.	Wheat Middlings, Low Grade Flour	Inferior article. Adulterated with rice hulls and rice bran. Below guaranty in protein and fat and above in fiber.
2305-21	Same	Same	Large amount of rice hulls, rice bran and rice starch present. Below guaranty in protein and above in fiber.
2305-21	Queen & Turner Ashland.	Same	Adulterated with rice hulls, rice bran, ground wheat screenings and weed seeds. Below guaranty in protein and fat and above in fiber.
2305-21	Pikeville Grocery Co.... Pikeville.	Same	Same.
194-20	Louis C. Huntemann.... Newport.	Wheat Middlings, Ground Wheat Screenings 10%	
1334-19	Mfrs. Warehouse	Wheat Middlings	Adulterated with wheat bran and screenings. Above guaranty in fiber.
1572-20	Same	Wheat	Above guaranty in fiber. Contains small per cent screenings.
2296-20	Geo. P. Taylor Co. Burnside.	Wheat Middlings	
1830-15	Mfrs. Warehouse	Wheat	Adulterated with wheat bran and screenings. Above guaranty in fiber.
1029-19	London Grocery Co. London.	Wheat Shorts, Ground Wheat Screenings 1%	Above guaranty in fiber.
1029-19	Smith-Chadwell & Co.... Middlesboro.	Same	Same.
1029-19	Bell Grocery Co. Pineville.	Same	The sample is mixed wheat and feed and not shorts. Above guaranty in fiber.
1029-19	W. T. Renfrow Franklin.	Same	Above guaranty in fiber.
1029-19	J. L. Bond Lawrenceburg.	Same	Excess of ground wheat bran and ground and unground wheat screenings. Above guaranty in fiber.
1029-20	Lewis Wholesale Co. Whitesburg.	Wheat Shorts, Ground Wheat Screenings 3%	Adulterated with ground wheat bran. Above guaranty in fiber.
1029-20	William P. Miller Louisville.	Same	Above guaranty in fiber.
1029-20	Welch's Dept. Store Berea.	Same	Same.
1029-21	Louis Cohen Central City.	Same	Excess of ground wheat bran and wheat screenings. Above guaranty in fiber.
1029-21	Consolidated Coal Co.... McRoberts.	Same	Same.
3057-20	Berry Bros. Ashland.	Wheat Middlings	
1057-19	Smith & Horton Grayson.	Wheat Middlings, Ground Wheat Screenings 1%	
1057-20	W. T. Sistrunk & Co.... Lexington.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1057-21	Money Maker Wheat Middlings	The Mansfield Milling Co.	17.63	5.33	5.77
	and Screenings	Mansfield, Ohio.	**16.00**	**4.00**	**7.50**
1417-19	Wheat Shorts and Screenings	Marshall Milling Co.	15.75	5.10	9.61
		Marshall, Minn.	**15.50**	**5.04**	**10.50**
1417-19	Same	Same	15.88	5.07	9.83
			15.50	**5.04**	**10.50**
2464-20	Milroy Wheat Middlings and	Milroy Milling Co.	16.13	5.05	9.04
	Screenings	Milroy, Ind.	**16.50**	**4.50**	**7.50**
2464-20	Same	Same	18.38	4.75	8.43
			16.50	**4.50**	**7.50**
2464-21	Same	Same	16.88	4.85	8.04
			16.50	**4.50**	**7.50**
412-19	Wheat Middlings and Screenings	National Feed Co.	17.75	4.15	7.71
		St. Louis, Mo.	**16.00**	**4.00**	**9.00**
......	Wheat Middlings	Northwestern Consld. Milling	15.00	5.26	10.13
		Co., Minneapolis, Minn.	**14.00**	**4.00**	**11.00**
1565-20	Wheat Middlings and Screenings	Nowak Milling Corp.	15.50	4.77	9.30
		Buffalo, N. Y.	**16.00**	**4.00**	**7.50**
1565-20	Same	Same	17.13	5.19	9.41
			16.00	**4.00**	**7.50**
141-20	"Nutritia" Winter Wheat Mid-	The Nutritia Co.	15.75	5.10	6.28
	dlings and Screenings	Cincinnati, Ohio.	**16.00**	**3.50**	**7.50**
141-20	Same	Same	16.88	4.15	7.10
			16.00	**3.50**	**7.50**
141-20	Same	Same	16.50	4.68	6.74
			16.00	**3.50**	**7.50**
141-20	Same	Same	14.38	5.84	7.47
			16.00	**3.50**	**7.50**
141-20	Same	Same	16.13	5.19	7.80
			16.00	**3.50**	**7.50**
141-20	Same	Same	15.50	4.79	9.83
			16.00	**3.50**	**7.50**
141-20	Same	Same	15.88	4.66	8.70
			16.00	**3.50**	**7.50**
902-19	Purity Middlings	Ohio Valley Milling & Supply	17.25	4.37	5.76
		Co., Ashland, Ky.	**16.88**	**4.85**	**6.50**
903-20	Standard Middlings	Same	16.13	5.25	10.46
			16.00	**4.20**	**7.25**
1592-20	Standard Middlings and Screen-	Ohio Valley Seed Co.	17.00	5.11	9.68
	ings	Evansville, Ind.	**16.00**	**4.50**	**7.50**
1137-19	Wheat Shorts and Screenings	Omaha Flour Mills Co.	17.75	4.60	6.94
		Omaha, Neb.	**15.00**	**3.50**	**8.00**
350-19	Pillsbury's Wheat Standard "B"	Pillsbury Flour Mills Co.	15.25	5.28	10.13
	Middlings	Minneapolis, Minn.	**14.00**	**4.00**	**11.00**
350-19	Same	Same	17.00	4.90	8.94
			14.00	**4.00**	**11.00**
350-19	Same	Same	17.00	5.05	9.11
			14.00	**4.00**	**11.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1057-21	London Grocery Co., London.	Wheat Middlings, Ground Wheat Screenings 1%	
1417-19	Ferncliff Feed & Grain Co., Louisville.	Wheat Shorts, Ground Wheat Screenings 8%	Weed seeds present.
1417-19	Ritter-Hennings Co., Louisville.	Same	Same.
2464-20	Consolidated Grocery Co. Ashland.	Wheat Middlings, Ground Wheat Screenings 10%	Adulterated with wheat bran. Above guaranty in fiber.
2464-20	W. T. Sistrunk & Co., Lexington.	Same	Same.
2464-21	The Eversole Co., London.	Same	Same.
412-19	Covington Bros. & Co., Murray.	Wheat Middlings, Ground Wheat Screenings 5%	
	Consolidated Coal Co., McRoberts.	Wheat Middlings, Ground Wheat Screenings 25%	Adulterated with corn bran, corn meal, ground and unground wheat bran.
1565-20	Associated Cooperators of Kentucky, Lexington.	Wheat Middlings, Ground Wheat Screenings 15%	Above guaranty in fiber. Excess of ground and unground wheat bran.
1565-20	John Jeems, Louisa.	Same	Same.
141-20	Smith-Chadwell & Co., Middlesboro.	Wheat Middlings, Ground Wheat Screenings 3%	Rice product present.
141-20	Pineville Produce Co., Pineville.	Same	Sample is rye middlings containing corn meal and screenings.
141-20	Same	Same	Screenings contain corn bran, corn meal, rice hulls, and weed seeds.
141-20	James A. Wallace, Irving.	Same	Below guaranty in protein. Corn product present.
141-20	L. J. Webb & Sons, Livingston.	Same	
141-20	S. T. Frazier, Whitesburg, Ky.	Same	Above guaranty in fiber.
141-20	M. F. Flannery, Augusta.	Same	Adulterated with wheat bran. Above guaranty in fiber.
902-19	J. H. Nunnery, Prestonburg.	Wheat Middlings	
903-20	Mfrs. Warehouse	Same	Adulterated with ground wheat bran, wheat screenings and weed seeds. Above guaranty in fiber.
1592-20	C. B. Carden, Hartford.	Wheat Middlings, Ground Wheat Screenings 6%	Adulterated with ground wheat bran. Above guaranty in fiber.
1137-19	Morganfield Roller Mills. Morganfield.	Wheat Shorts, Ground Wheat Screenings 8%	
350-19	Thos. Jameson & Son, Beattyville.	Standard Wheat Middlings, Ground Wheat Screenings 15%	
350-19	Murray & Penick, Murray.	Same	Adulterated with ground wheat bran.
350-19	J. F. Freeman, Hawesville.	Same	Same.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
350-19	Pillsbury Wheat Standard "B" Middlings	Pillsbury's Flour Mills Co.	16.50	5.56	9.68
		Minneapolis, Minn.	14.00	4.00	11.00
2052-19	Wheat Middlings and Screenings	Pink & Co.	16.38	4.36	6.90
		Cairo, Ill.	15.00	4.00	6.00
85-19	Middlings	The R. C. Poage Milling Co.	15.88	4.63	8.82
		Ashland, Ky.	15.69	4.33	5.38
2559-20	Wheat Shorts and Screenings	Poseyville Milling Co.	18.50	5.17	7.55
		Evansville, Ind.	16 00	4.00	7.50
2584-20	Potts' White Middlings	R. L. Potts & Sons	16.50	3.78	4.19
		Whites Station, Ky.	16.00	3.02	2.58
2584-20	Same	Same	15.25	2.66	1.92
			16.00	3.02	2.58
3284-21	Wheat Middlings and Screenings	M. G. Rankin & Co.	16.88	5.75	7.38
		Milwaukee, Wis.	16.00	3.50	.7 50
	Wheat Middlings and Screenings				
508-19	Flour Middlings and Screenings	M. G. Rankin & Co.	17.00	4.94	7.44
		Milwaukee, Wis.	14.00	3.00	6.00
508-19	Same	Same	20.13	5.45	6.39
			14.00	3.00	6.00
355-19	Standard Middlings and Screenings	Same	15.13	5.19	10.65
			14.00	4 00	11.00
3158-21	Gray Middlings	Rapier Sugar Feed Co.	18.88	5.10	4.98
		Owensboro, Ky.	16.00	3.50	6.50
2749-20	Beach Nut Brand White Wheat Middlings and Screenings	Saunders-Weider Co.	16.75	5.85	8.45
		Huntington, W. Va.	16.00	4.25	7.25
1510-19	Wheat Standard Middlings and Screenings	Shane Bros. & Wilson Co.	16.50	4.76	10.03
		Minneapolis, Minn.	15.50	5.30	10.30
2637-18	Wheat Middlings	Simmons & Norris	16.63	5.50	10.03
		Cincinnati, Ohio.	15.50	4.50	6.00
2842-20	"Standco" Middlings and Screenings	Snyder Milling Co.	16.25	4.60	5.93
		Chillicothe, Ohio.	16.00	3.50	7.50
549-19	Economy Wheat Shorts	Southern Seed Co.	17.00	3.93	9.43
		Louisville, Ky.	15.00	4.00	6.00
549-19	Same	Same	16.25	3.53	9.45
			15.00	4.00	6.00
549-20	Same	Same	17.00	4.93	8 44
			16.00	4.00	6.00
549-20	Same	Same	17.50	4.09	8.31
			16.00	4.00	6.00
549-20	Same	Same	17.75	4.20	8.32
			16.00	4.00	6.00
1201-20	Red Turkey Brown Shorts and Wheat Scourings	The Southwestern Milling Co.	18.00	4.84	8.30
		Kansas City, Mo.	15.00	4.20	8.50
2353-19	Famous Gray Shorts	Stapp-Smullen Milling Co.	15.25	3.84	5.45
		Corydon, Ky.	16.00	4.50	7.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
350-19	Consolidated Coal Co. .. Jenkins.	Standard Wheat Middlings, Gr'nd Wheat Screenings 15%	Adulterated with ground wheat bran.
2052-19	C. E. Mooney.......... Hickman.	Wheat Middlings, Ground Wheat Screenings 8%	
85-19	Mfrs. Warehouse	Wheat Middlings	Above guaranty in fiber. Adulterated with wheat bran.
2559-20	T. F. Hart .... Henderson.	Wheat Shorts, Ground Wheat Screenings 4½%............	
2584-20	Arnett Bros. .... Berea.	Wheat Middlings	Above guaranty in fiber.
2584-20	Gabbard & Perkins .... Berea.	Same	Below guaranty in protein.
3284-21	Kitchen-Whitt & Co..... Ashland.	Wheat Middlings, Ground Wheat Screenings 15%	
508-19	Van Lear Wholesale Co.. West Van Lear.	Wheat Middlings, Ground Wheat Screenings 15%	Above guaranty in fiber.
508-19	Same	Same	Adulterated with ground weed seeds.
355-19	Pikeville Grocery Co.... Pikeville.	Same	Adulterated with finely ground wheat bran.
3158-21	W. T. Morgan.......... Lewisburg.	Wheat Middlings	
2749-20	Big Sandy Grocery Co... Cattlettsburg.	Wheat Middlings, Ground Wheat Screenings 3%	Above guaranty in fiber. Adulterated with ground wheat bran. Excess of ground wheat screenings, chaff and weed seeds.
1510-19	N. D. Tabor............ Olive Hill.	Wheat Middlings, Ground Wheat Screenings 2%	Below guaranty in fat. Excess ground wheat bran.
2637-18	M. F. Fletcher & Co. .... Science Hill.	Wheat	Above guaranty in fiber.
2842-20	J. E. Lynd............. Russell.	Wheat Middlings, Ground Wheat Screenings 2%	
549-19	Geo. L. Ware........... Clay City.	Wheat Shorts, Ground Wheat Screenings 3%	Above guaranty in fiber.
549-19	Owens & Bacon .... Munfordville.	Same	Same.
549-20	Sam Terry .... Big Clifty.	Same	Above guaranty in fiber. Adulterated with wheat bran.
549-20	S. L. Cummins .... Crab Orchard.	Same	Same.
549-20	D. L. D. Sanderfer ..... Beaver Dam.	Same	Same.
1201-20	W. T. Sistrunk & Co.... Lexington.	Wheat Brown Shorts, Wheat Scourings 5%	Adulterated with wheat bran.
2353-19	N. J. Toombs.......... Madisonville.	Gray Wheat Shorts	Below guaranty in protein and fat.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2152-19	Wheat Middlings	The Stritmatter Grain &	17.50	4.32	6.34
		Milling Co., Waverly, O.	15.50	4.40	6.50
330-18	Wheat Middlings and Screenings.	Sutherland Flour Mills Co.	17.13	5.28	10.98
		Cairo, Ill.	16.00	4.75	8.00
1192-19	Same	Same	16.25	4.55	7.83
			14.50	4.00	12.00
1312-19	Wheat Middlings and Screenings.	Tell City Flouring Mills	15.50	4.64	6.14
		Tell City, Ind.	14.50	4.00	8.00
2804-20	Wheat Middlings	Vine Grove Milling Co.	15.88	3.10	1.99
		Vine Grove, Ky.	16.25	4.00	6.50
1322-19	Wheat Standard Middlings and	Washburn-Crosby Co.	16.88	5.08	9.35
	Screenings	Minneapolis, Minn.	14.00	4.00	11.00
1930-20	Shorts	Winchester Roller Mills	16.25	4.31	7.45
		Winchester, Ky.	16.35	4.05	6.03
1930-20	Same	Same	16.13	4.19	6.60
			16.35	4.05	6.03
1930-20	Same	Same	16.50	5.12	6.00
			16.35	4.05	6.03
1930-20	Same	Same	15.88	3.85	6.78
			16.35	4.05	6.03
2130-19	Middlings	The Worley Bros. Co.	17.75	4.55	6.36
		Bainbridge, Ohio.	15.30	3.90	8.20
2130-20	Same	Same	17.00	4.14	4.77
			16.00	3.50	7.50
	(Shipstuff) Mixed Wheat Feed				
299-20	Acme Feed	Acme-Evans Co.	15.88	4.51	8.18
		Indianapolis, Ind.	16.50	4.00	9.00
299-20	Same	Same	15.50	4.69	9.01
			16.50	4.00	9.00
299-20	Same	Same	16.88	4.56	8.06
			16.50	4.00	9.00
299-19	Same	Same	16.63	4.55	8.72
			16.50	4.00	9.00
299-19	Same	Same	16.75	4.96	9.13
			16.50	4.00	9.00
299-19	Same	Same	16.38	5.03	8.83
			16.50	4.00	9.00
299-19	Same	Same	15.63	4.20	9.28
			16.50	4.00	9.00
299-19	Same	Same	16.38	5.25	8.90
			16.50	4.00	9.00
299-19	Same	Same	15.00	4.70	9.88
			16.50	4.00	9.00
299-19	Same	Same	16.75	4.59	8.50
			16.50	4.00	9.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2152-19	Wheeler Grocery Co. Paintsville.	Wheat Middlings	Ground weed seeds present.
330-18	Princeton Feed & Produce Co., Princeton.	Soft Winter Wheat Middlings, Ground Wheat Screenings 10%	Above guaranty in fiber.
1192-19	Covington Bros. & Co. Paducah.	Wheat Middlings, Ground Wheat Screenings 10%	Adulterated with finely ground wheat bran.
1312-19	W. C. Kelly Hawesville.	Wheat Middlings, Red Dog Flour, Ground Wheat Screenings 3%.	
2804-20	Mfrs. Warehouse	Wheat Middlings	This is white wheat middlings or red dog flour. Below guaranty in fat.
1322-19	C. J. Clausen Louisville.	Wheat Standard Middlings, Ground Wheat Screenings 15%	
1930-20	C. S. Cartee Olive Hill.	Wheat Shorts	Above guaranty in fiber.
1930-20	J. R. Blake Jackson.	Same	Same.
1930-20	Hardwick & Co. Stanton.	Same	
1930-20	Kentucky Block Cannel Coal Co., Cannel City.	Same	Below guaranty in protein and above in fiber. Screenings present.
2130-19	The O. H. Stumbo Co. Prestonburg.	Wheat	
2130-20	Hines & Stricklett Vanceburg.	Same	
299-20	Powell-Hackney Grocery Co., Jackson.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 10%	Below guaranty in protein.
299-20	W. T. Sistrunk & Co. Lexington.	Same	Same.
299-20	Farmers Union Supply Co. Franklin.	Same	
299-19	J. W. James Grocery Co. Franklin.	Same	
299-19	Wilson & Son Russellville.	Same	
299-19	Edward M. Riedling. Louisville.	Same	
299-19	Cleveland & Co. Versailles.	Same	Below guaranty in protein.
299-19	C. C. McKnight London.	Same	
299-19	J. C. Everett & Co. Maysville.	Same	Same.
299-19	Bush & Prichard Ashland.	Same	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2300-19	Hoosier Feed	Acme-Evans Co.	17.50	4.61	8.98
		Indianapolis, Ind.	**16.50**	**4.00**	**9.00**
299-19	Acme Feed	Same	16.50	4.52	9.15
			16.50	**4.00**	**9.00**
2220-19	Ajayco Wheat Feed and Screenings	Acme-Jones Co.	15.00	3.53	7.06
		Louisville, Ky.	**16.00**	**4.00**	**9.00**
396-19	Big X Feed	Same	17.88	4.05	8.25
			15.00	**4.00**	**9.00**
396-19	Same	Same	16.75	4.68	8.48
			15.00	**4.00**	**9.00**
747-19	Winter Mixed Wheat Feed and Screenings	Akin-Erskine Milling Co.	17.13	4.08	7.50
		Evansville, Ind.	**15.00**	**4.00**	**9.50**
166-18	Trojan Mixed Wheat Feed and Screenings	The Allen & Wheeler Co.	17.00	4.76	9.71
		Troy, Ohio.	**14.50**	**4.00**	**8.00**
741-20	Same	Same	16.63	5.12	8.25
			15.50	**4.00**	**8.00**
1351-19	Mixed Wheat Feed and Screenings	The Ansted & Burk Co.	17.63	4.47	6.19
		Springfield, Ohio.	**14.00**	**4.50**	**8.50**
1351-19	Same	Same	16.38	4.15	7.48
			14.00	**4.50**	**8.50**
2634-20	Aubrey's Feed and Screenings	Aubrey & Co.	16.13	4.86	8.14
		Louisville, Ky.	**16.00**	**4.00**	**10.00**
2634-20	Same	Same	17.50	5.64	8.33
			16.00	**4.00**	**10.00**
787-19	Bull's Eye Mixed Feed	Blish Milling Co.	17.13	4.57	8.48
		Seymour, Ind.	**16.00**	**4.40**	**9.10**
3044-18	Mixed Wheat Feed and Screenings	Bloomfield Mill Co.	12.50	3.95	3.89
		Bloomfield, Ky.	**15.25**	**4.00**	**8.50**
3132-21	Mill Feed	Boyd Milling Co.	15.50	3.50	6.13
		Boyd, Ky.	**16.00**	**4.50**	**8.50**
1715-19	Mixed Wheat Feed	Carey Bros.	15.50	3.98	5.95
		Tatham Springs, Ky.	**15.50**	**4.50**	**8.50**
1400-19	Shipstuff	Carlisle Milling Co.	16.88	4.35	6.85
		Carlisle, Ky.	**14.41**	**4.34**	**8.25**
1278-15	Mixed Wheat Feed	R. A. Carr	12.00	2.50	3.43
		Maysville, Ky.	**15.75**	**4.25**	**7.75**
1953-19	Mixed Wheat Feed	Central Milling Co.	17.25	4.55	8.82
		Brodhead, Ky.	**15.75**	**4.25**	**8.50**
1571-19	Pure Winter Wheat Mixed Feed and Screenings	The Colton Bros. Co.	15.50	4.95	8.78
		Bellefontaine, Ohio.	**15.50**	**4.50**	**8.00**
1571-19	Same	Same	16.00	4.43	8.30
			15.50	**4.50**	**8.00**
2461-21	Mixed Wheat Feed	Community Milling Co.	15.88	4.17	7.30
		Irvington, Ky.	**16.00**	**4.60**	**8.00**
855-20	Shipstuff	Crescent Roller Mills	16.25	4.35	7.20
		Taylorsville, Ky.	**15.62**	**3.50**	**7.50**
583-19	Wheat Mixed Feed	The Early & Daniel Co.	17.13	5.74	9.18
		Cincinnati, Ohio.	**14.00**	**3.00**	**11.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2300-19	Middlesboro Wholesale Grocery Co., Middlesb'r	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 1%.	
299-19	Caudill, Blair & Co. Morehead.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 10%	
2220-19	The Mahan Co. Hazard.	Low Grade Flour, Wheat Middlings, Wheat bran, ground wheat screenings 5%	Low in protein due to a large percentage of wheat flour present.
396-19	Jellico Grocery Co. Manchester.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 15½	
396-19	Smith-Chadwell & Co. Middlesboro.	Same	
747-19	Sam Nahm & Co. Bowling Green.	Winter wheat bran, winter wheat shorts, ground wheat screenings 1%, salt 1%	
166-18	Miller & Hopper Barbourville.	Wheat, Ground Wheat Screenings 3%	Above guaranty in fiber. Excess of ground wheat bran.
741-20	R. M. Harrison & Son Maysville.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 3%.	
1351-19	The Ohio Valley Mill & Supply Co., Ashland.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 2%.	
1351-19	W. A. Fischer Flemingsburg.	Same	
2634-20	C. A. Casteel East Bernstadt.	Wheat middlings, fine ground wheat bran, ground wheat screenings 6%	
2634-20	N. Y. Landrum & Co. Tomkinsville.	Same	
787-19	McCauley & Cain Versailles.	Wheat Bran, Wheat Middlings	
3044-18	J. A. Allen Bloomfield.	Wheat Bran, Wheat Shorts, Ground Wheat Screenings 4%	Below guaranty in protein. Contains unground wheat screenings and ground corn.
3132-21	Cynthiana Coal Co. Cynthiana.	Wheat Bran, Wheat Middlings, Unground Wheat Screen'gs 3%	Below guaranty in fat.
1715-19	Lake Bros. Springfield.	Wheat Bran, Wheat Middlings	Same.
1400-19	W. T. McDonald Carlisle.	Wheat Bran, Shorts	
1278-15	Mfrs. Warehouse.	Wheat Bran, Middlings	Below guaranty in protein and fat.
1953-19	Same	Wheat Bran, Wheat Shorts	
1571-19	The Arcade Store Barbourville.	Pure winter wheat bran, pure winter wheat middlings, ground wheat screenings 4%	
1571-19	Consolidated Coal Co. Van Lear.	Same	
2461-21	Gray & Trent Irvington.	Wheat Bran, Wheat Shorts	
855-20	Mfrs. Warehouse	Same	Unground wheat screenings present.
583-19	R. P. McDaniel Whitley City.	Wheat Bran, Wheat Middlings	

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
583-19	Wheat Mixed Feed	The Early & Daniel Co.	14.38	4.11	9.88
		Cincinnati, Ohio.	14.00	3.00	11.00
583-19	Same	Same	17.63	4.54	9.63
			14.00	3.00	11.00
583-19	Same	Same	16.75	4.85	8.26
			14.00	3.00	11.00
583-20	Same	Same	16.88	4.28	8.02
			15.50	4.00	8.50
2577-21	Eadan Kentucky Feed	Same	16.88	5.28	8.85
			15.00	3.50	10.00
827-19	Mixed Wheat Feed and Screenings	Edinger & Co.	19.00	4.97	8.65
		Louisville, Ky.	15.50	3.94	.8.50
134-19	“Nutritia” Mixed Wheat Feed and Screenings	The Eikenberry - Fitzgerald	17.88	5.14	9.75
		Co., Cincinnati, Ohio.	15.20	2.50	10.00
1160-20	Mixed Wheat Feed and Screenings	Fisher Bros.	17.38	5.04	9.47
		Evansville, Ind.	15.50	4.00	8.50
2380-20	Shipstuff	Germantown Milling Co.	16.63	4.62	7.02
		Germantown, Ky.	15.75	4.25	8.50
2069-21	Mixed Wheat Feed	Glasgow Milling Co.	16.50	4.07	7.60
		Glasgow, Ky.	15.50	4.25	8.50
898-18	Mixed Wheat Feed and Screenings	Gwinn Bros. & Co.	17.25	4.60	8.53
		Huntington, W. Va.	13.78	3.96	7.64
1229-19	Mixed Wheat Feed and Screenings	Herndon Carter Co.	19.00	4.72	9.50
		Louisville, Ky.	14.99	4.00	8.00
173-18	Pure Bran and Shorts	Horse Cave Mills	15.00	4.92	7.85
		Horse Cave, Ky.	15.50	4.25	7.50
1858-20	Pure Bran and Shorts	Same	16.88	3.73	6.70
			15.50	4.25	7.50
1858-20	Pure Bran and Shorts	Same	17.63	3.90	7.00
			15.50	4.25	7.50
2027-19	Mixed Wheat Feed	The Ideal Roller Mills	15.88	3.78	5.78
		Falmouth, Ky.	15.00	4.00	8.00
2027-19	Same	Same	16.50	4.45	7.28
			15.00	4.00	8.00
2027-19	Same	Same	16.25	4.35	7.37
			15.00	4.00	8.00
2585-20	Mill Feed	Jones Bros.	15.13	3.60	5.31
		Winchester, Ky.	15.50	4.00	8.50
2585-20	Same	Same	15.75	4.35	8.73
			15.50	4.00	8.50
415-19	“Snowflake” Mixed Wheat Feed and Screenings	Lawrenceburg Roller Mills	17.63	4.60	8.49
		Co., Lawrenceburg, Ind.	14.00	3.00	8.50
1210-20	Shipstuff	Loretto Mills Co.	17.00	4.94	8.18
		Loretto, Ky.	15.50	4.10	8.50
1030-19	Mixed Wheat Feed and Screenings	Louisville Milling Co.	17.38	4.14	8.57
		Louisville, Ky.	14.50	4.00	8.00
1030-20	Same	Same	16.75	3.84	8.93
			15.50	4.00	8.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
583-19	Adams Feed & Supply Co. Whitesburg.	Wheat Bran, Wheat Middlings	Sample is wheat bran and not wheat mixed feed.
583-19	Lester, Crawford & Baugh, Science Hill.	Wheat Bran, Wheat Shorts	Excess of wheat bran.
583-19	Hudson, Hughes & Farnan, Lancaster.	Wheat Bran, Wheat Middlings	
583-20	Augusta Milling Co. Augusta.	Same	
2577-21	Powell-Hackney Grocery Co., Jackson.	Wheat middlings, ground wheat bran, low grade flour, ground wheat screenings 5%	No low grade flour present. Weed seeds present.
827-19	R. B. Hayes & Co. Hodgenville.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 3%	
134-19	F. H. Gordon Richmond.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 3%	
1160-20	Henry Paris Marion.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 8%	Excess wheat bran present. Above guaranty in fiber.
2380-20	R. M. Harrison & Son Maysville.	Wheat Bran, Shorts, Middlings.	
2069-21	Mfrs. Warehouse.	Wheat Bran, Wheat Shorts	
898-18	Robt. Williams Pikeville.	Wheat Bran, Middlings, Ground Wheat Screenings 2%	Above guaranty in fiber.
1229-19	H. W. McCandless Munfordville.	Wheat Bran, Wheat Shorts, Ground Wheat Screenings 7%	Same.
173-18	Hulen-Toops Co. Munfordville.	Wheat Bran, Shorts	
1858-20	Troutman Bros. Shepherdsville.	Same	Below guaranty in fat. Wheat chaff present.
1858-20	Mfrs. Warehouse	Same	Wheat chaff and unground wheat screenings present.
2027-19	Wm. Hamlin & Co. Falmouth.	Soft Winter Wheat Bran, Soft Winter Wheat Middlings	
2027-19	Mfrs. Warehouse	Same	Ground and unground wheat screenings present.
2027-19	Same	Same	Unground wheat screenings present.
2585-20	Kentucky River Coal & Feed Co., Irvine.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 1%	
2585-20	Same	Same	
415-19	Powell-Hackney Grocery Co., Hazard.	Soft Wheat Bran, Soft Wheat Midd'gs, Gr. Wheat Scr'gs 5%	
1210-20	Parkland Feed Co. Louisville.	Wheat Shorts, Wheat Bran	
1030-19	Kentucky Feed Co. Flemingsburg.	Wheat Bran, Wheat Shorts Gr'd Wheat Screenings 1%	Above guaranty in fiber.
1030-20	Somerset Milling Co. Somerset.	Same	Same.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2508-20	Mill Run Mixed Wheat Feed and Screenings	Magnolia Flour Mills	17.50	4.87	7.33
		Maysville, Ky.	16.38	4.25	8.48
2508-20	Same	Same	16.38	4.80	7.60
			16.38	4.25	8.48
3309-21	"Markin-Blantons Co's." Black Hawk Feed	The Markin-Blanton Co.	17.00	5.29	8.20
		Ironton, Ohio.	15.00	4.50	9.20
2308-19	Wheat Bran and Shorts	Marshall County Milling Co.	15.75	3.85	6.58
		Benton, Ky.	15.65	4.15	9.25
1060-19	Mennel's Winter Mixed Feed and Screenings	The Mennel Milling Co.	16.13	4.39	7.69
		Toledo, Ohio.	15.00	4.00	8.00
1060-20	Same	Same	15.75	5.24	7.82
			15.50	4.00	8.00
2174-19	Lloyds Mixed Wheat Feed	Midget Milling Co.	16.13	3.91	7.33
		Providence, Ky.	15.65	4.40	9.25
2463-20	Milroy Mixed Wheat Feed and Screenings	Milroy Milling Co.	17.88	5.28	8.01
		Milroy, Ind.	16.50	4.00	8.50
2463-20	Same	Same	18.13	4.42	7.87
			16.50	4.00	8.50
2463-20	Same	Same	15.88	4.45	8.03
			16.50	4.00	8.50
1891-16	Shipstuff	Moss Milling Co.	17.50	3.96	7.30
		Greensburg, Ky.	16.00	4.50	8.10
1900-20	Shipstuff	New Edmonton Mills	18.00	3.74	7.59
		Edmonton, Ky.	15.50	4.00	8.00
1485-19	Shipstuff	Nolin Milling Co.	15.75	5.53	7.23
		Nolin, Ky.	15.50	4.50	8.50
1485-19	Same	Same	15.00	5.28	7.84
			15.50	4.50	8.50
1485-20	Same	Same	16.63	3.45	4.75
			15.50	4.50	8.50
1902-20	"Omilco" Soft Winter Mixed Wheat Feed	Owensboro Milling Co.	15.50	4.38	8.59
		Owensboro, Ky.	16.00	4.00	7.85
2099-20	Mixed Wheat Feed	Same	17.25	5.01	7.61
			15.50	4.15	8.15
2397-20	Shipstuff	Payne & Estes	18.13	4.39	8.55
		Eubank, Ky.	15.50	3.56	8.50
3129-21	Parson's Mixed Wheat Feed	Pendleton Flour Mills	17.50	4.10	6.10
		Falmouth, Ky.	15.87	4.33	8.50
351-19	Pillsbury's Fancy Wheat Mixed Feed and Screenings	Pillsbury Flour Mills Co.	17.25	4.98	7.18
		Minneapolis, Minn.	14 00	4.00	10.00
1212-19	Buckeye Wheat Mixed Feed	The Quaker Oats Co.	15.63	4.08	7.60
		Chicago, Ill.	15.50	4.50	8.50
1212-19	Same	Same	16.25	5.26	10.53
			15.50	4.50	8.50
1212-19	Same	Same	16.25	5.22	10.02
			15.50	4.50	8.50
2659-20	Fancy Feed	M. G. Rankin & Co.	18.25	5.76	7.43
		Milwaukee, Wis.	14.00	4.00	6.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2508-20	Mfrs. Warehouse	Wheat Bran, Wheat Middlings, Gr. Wheat Screenings 3 1-3%	
2508-20	Same	Same	Corn bran present.
3309-21	Louisa Flour & Feed Co.. Louisa.	Wheat Middlings, Wheat Bran, Ground Wheat Screenings 6%	Weed seeds present.
2308-19	Mfrs. Warehouse	Bran, Shorts	
1060-19	Jellico Grocery Co. Harlan.	Winter wheat bran, winter wheat middlings, ground wheat screenings 2%.	
1060-20	Jellico Grocery Co. Barbourville.	Same	
2194-19	Benjamin Hardware Co.. Providence.	Wheat Bran, Shorts, Middlings	
2463-20	Consolidated Grocery Co. Ashland.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 10%	
2463-20	Thos. Jameson & Son Beattyville.	Same	
2463-20	The Eversole Co. London.	Same	Below guaranty in protein. Wheat chaff present.
1891-16	Mfrs. Warehouse	Wheat Bran, Shorts	Below guaranty in fat.
1900-20	Same	Wheat Bran, Wheat Middlings	
1485-19	M. C. Marion Elizabethtown.	Wheat Bran, Wheat Shorts	
1485-19	Dickey & Lodgsdon Munfordville.	Same	
1485-19	W. M. Smith Upton.	Same	Below guaranty in fat. Wheat chaff present.
1902-20	S. H. Winstead & Son Owensboro.	Winter Wheat Bran, Winter Wheat Shorts	Above guaranty in fiber.
2099-20	Cohen Bros. Central City.	Soft Winter Wheat Bran, Soft Winter Wheat Middlings	Unground wheat screenings present.
2397-20	Mfrs. Warehouse	Wheat Bran, Wheat Middlings	Cheat and corn cockle present.
3129-21	Same	Same	
351-19	Morgan-Crenshaw Georgetown.	Wheat Bran, Red Dog Flour, Ground Wheat Screenings 15%	
1212-19	Crab Orchard Milling Co. Crab Orchard.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 2%	
1212-19	Pulaski County Mill & Grain Co., Somerset.	Same	Above guaranty in fiber. A smaller percentage of middlings than is usually found in mixed wheat feed.
1212-19	Caudill, Hall Co. Morehead.	Same	Excess of wheat bran. Above guaranty in fiber.
2659-20	Consolidated Grocery Co. Olive Hill.	Wheat Middlings, Ground Wheat Screenings 15%	Above guaranty in fiber.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot	Fat	Fiber
2660-20	Rankin's Standard Feed	M. G. Rankin & Co.	16.50	4.89	8.35
		Milwaukee, Wis.	12.50	4.50	11.00
2458-20	Shipstuff	Rapier Grain & Seed Co.	16.25	4.38	8.30
		Owensboro, Ky.	16.50	4.00	8.50
2883-20	Mixed Wheat Feed and Screenings	Ruef Bros.	17.00	4.61	7.65
		Covington, Ky.	16.00	4.50	7.50
2820-20	Mixed Wheat Feed	Sandefur & Crook	16.88	4.42	6.48
		Henderson, Ky.	16.00	4.50	8.50
1793-15	Shipstuff	Sardis Milling Co.	17.25	3.96	5.79
		Sardis, Ky.	16.00	4.20	8.50
......	Sunbeam Mill Feed	Schultz, Baujan & Co.	17.75	4.86	8.40
		Beardstown, Ill.	15.00	3.50	10.00
1636-15	Mixed Wheat Feed	Scoville Milling Co.	17.00	5.08	7.78
		London, Ky.	15.25	4.00	8.00
2065-19	Shipstuff	Sebree Roller Mills	18.38	5.75	6.33
		Sebree, Ky.	16.00	4.00	7.00
1455-20	Shipstuff	J. A. Shaver	17.50	4.18	5.98
		Greenville, Ky.	15.75	4.46	8.25
1539-19	Mixed Wheat Feed	Simmons Milling Co.	17.38	5.83	8.95
		Cincinnati, Ohio.	15.00	4.50	12.00
1894-19	Mixed Feed	Southern Illinois Milling &	16.25	4.18	7.73
		Elevator Co., Metropolis Ill.	15.29	4.23	8.50
1894-19	Same	Same	15.63	4.45	7.48
			15.29	4.23	8.50
24-19	"Try Me" Mixed Wheat Feed and Screenings	Sparks Milling Co.	17.75	4.48	8.54
		Alton, Ill.	16.00	3.50	9.00
24-20	Same	Same	17.75	4.71	7.83
			16.00	3.50	9.00
24-20	Same	Same	17.75	3.93	7.48
			16.00	3.50	8.50
3259-21	Shipstuff	Stevensport Mill and Elevator Co., Stevensport, Ky.	16.75	5.00	5.42
			16.00	4.00	8.50
145-20	Sutherland Feed	D. B. Sutherland & Sons	16.13	4.45	6.40
		Bloomfield, Ky.	15.00	4.50	8.50
2498-20	Fox Creek Mill Feed	Sweeney Bros.	17.13	3.89	6.97
		Fox Creek, Ky.	15.50	4.25	8.50
1612-21	Mixed Wheat Feed and Screenings	Tradewater Milling Co., Inc.	15.38	4.19	9.75
		Sturgis, Ky.	15.50	4.25	7.50
564-19	Valier's Mixed Wheat Feed and Screenings	Valier & Spies Milling Co.	17.38	5.00	9.35
		St. Louis, Mo.	15.00	4.00	9.00
564-19	Same	Same	17.50	4.45	8.83
			15.00	4.00	9.00
564-19	Same	Same	17.63	4.78	9.82
			15.00	4.00	9.00
2372-20	Purity Wheat Feed and Screenings	John Wade & Sons	13.88	4.52	8.83
		Memphis, Tenn.	15.50	3.50	8.00
2005-19	Mixed Wheat Feed and Screenings	Wilkes & Seaman	15.25	4.50	9.28
		Louisville, Ky.	15.00	3.94	8.50

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2660-20	Burnam Roberts .... Louisa.	Wheat Middlings, Ground Wheat Screenings 15%	
2458-20	Henderson Feed Store .. Henderson.	Wheat Bran, Wheat Middlings ..	
2883-20	Mfrs. Warehouse.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 12%	
2820-20	A. Niswanger .... Providence.	Wheat Bran, Wheat Middlings..	
1793-15	R. M. Harrison & Son... Maysville.	Wheat Bran, Middlings	
	Greenup Milling Co. .... Greenup.	Pure wheat middlings, mill run screenings, ground bran, low grade flour..	
1636-15	Mfrs. Warehouse	Wheat Bran, Shorts	
2065-19	Same	Wheat Bran, Middlings	
1455-20	E. A. Cohen .... Greenville.	Wheat Bran, Wheat Shorts	
1539-19	R. S. Van Arsdell & Bros. Harrodsburg.	Wheat	
1894-19	Covington Bros. & Co... Murray.	Wheat Bran, Wheat Middlings, Ground Wheat Screenings 9%.	Unground wheat screenings present.
1894-19	M. J. Yopp Seed Co. .... Paducah.	Same	Corn bran and unground wheat screenings present.
24-19	Grant North .... Salt Lick.	Wheat bran, middlings, shorts, ground wheat screenings 2%.	
24-20	G. F. Korfhage & Son... Louisville.	Same	
24-20	Cleveland & Co......... Versailles.	Same	
3259-21	Mfrs. Warehouse	Wheat shorts, wheat middlings, red dog flour.................	
145-20	J. A. Allen............. Bloomfield.	Wheat bran, wheat middlings, ground wheat screenings 5%.	
2498-20	Farmers Union Sup. Co.. Lawrenceburg.	Wheat shorts, wheat bran......	
1612-21	C. H. Spicer............ Dawson Springs.	Wheat shorts, wheat bran, ground wheat screenings 2%.	Above guaranty in fiber
564-19	J. C. Everett & Co...... Maysville.	Wheat bran, wheat middlings, ground wheat screenings 4%..	
564-19	Franklin Ele. & Wareh'se Co., Franklin.	Same	
564-19	Latonia H. & Gr. Co.... Covington.	Same	Above guaranty in fiber.
2372-20	J. W. James Groc. Co... Franklin.	Wheat shorts, wheat bran, low grade flour, ground screenings 8%.......	Below guaranty in protein and above in fiber.
2005-19	Mahan & Co........... Williamsburg.	Wheat bran, wheat middlings, ground wheat screenings 3%..	Above guaranty in fiber.

TABLE I.—STRAIGHT FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
460-20	Ziliak's Mixed Wheat Feed and Screenings	Ziliak & Schafer Milling Co.	16.75	4.88	9.32
		Evansville, Ind.	**16.69**	**4.32**	**6.49**
	Red Dog Flour				
3214-21	Standard Wheat Red Dog	Ladish Milling Co.	16.75	4.13	4.35
		Milwaukee, Wis.	**16.00**	**3.50**	**3.50**
1031-20	Red Dog	Louisville Milling Co.	19.13	3.58	5.13
		Louisville, Ky.	**16.00**	**4.00**	**3.50**
2325-19	Red Dog Flour	M. G. Rankin & Co.	18.38	4.25	2.37
		Milwaukee, Wis.	**16.00**	**3.70**	**2.75**
3159-21	Red Dog Flour	Rapier Sugar Feed Co.	16.63	2.88	2.75
		Owensboro, Ky.	**16.50**	**4.00**	**3.50**
2885-20	XX Dairy Feed	Ruef Bros.	18.13	4.09	3.33
		Covington, Ky.	**16.50**	**3.65**	**3.50**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
460-20	W. E. Ellis & Bros..... Hartford.	Wheat bran, wheat middlings, wheat screenings 1%.........	Above guaranty in fiber. Practically no middlings present.
3214-21	Consolidated Groc. Co... Olive Hill.	Red dog flour..................	Wheat middlings and not red dog. Above guaranty in fiber.
1031-20	Amer. Cooperative Assoc. Owensboro.	Fine wheat middlings..........	Above guaranty in fiber.
2325-19	Moore & Jordan........ Louisa.	Low grade wheat flour.........	
3159-21	G. H. Harris........... Cloverport.	Low grade flour................	Below guaranty in fat.
2885-20	Mfrs. Warehouse	Low grade flour................	Wheat middlings and not low grade flour.

TABLE II.—MIXED FEEDS.

Reg No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
	Mixed Feeds, Wheat and Corn				
764-20	Acme Feed	Acme Milling Co.	14.38	4.67	5.40
		Talbott, Tenn.	15.00	4.50	9.00
763-19	Anderson and Spilman Feed	Anderson & Spilman	15.25	6.80	8.03
		Danville, Ky.	13.50	3.63	5.60
342-19	Mixed Feed	Arlington Roller Mills	16.13	4.88	8.93
		Arlington, Ky.	13.50	4.44	9.10
342-20	Same	Same	15.00	4.40	7.50
			13.50	4.44	9.10
166-19	Eureka Feed	Ashland Milling Co.	14.25	5.83	7.32
		Ashland, Ky.	14.06	4.77	9.08
166-21	Same	Same	14.00	4.51	9.27
			14.06	4.77	9.08
751-19	Mixed Feed	The Auburn Mills	15.38	5.00	10.68
		Auburn, Ky.	14.00	4.25	9.75
751-20	Same	Same	14.88	4.77	10.46
			14.50	4.25	9.75
769-20	Mixed Mill Feed	J. H. Baughman & Co.	16.88	4.50	7.05
		Stanford, Ky.	14.38	4.61	8.25
843-19	Mixed Feed	Beaver Dam Milling Co.	14.88	5.95	7.25
		Beaver Dam, Ky.	14.10	4.25	8.65
144-19	Mixed Feed	Boston Mills	16.50	3.81	7.28
		Boston, Ky.	15.19	4.27	8.65
623-20	Mixed Feed	Bowling Green Milling Co.	15.25	4.05	7.90
		Bowling Green, Ky.	15.19	4.17	8.50
2686-20	Mixed Feed	Boyle Roller Mills	17.38	4.67	6.50
		Junction City, Ky.	15.50	4.50	7.50
2686-20	Same	Same	17.00	4.89	6.03
			15.50	4.50	7.50
96-17	XX Mixed Feed	Chas. Broeker & Co.	15.50	6.65	6.35
		Owensboro, Ky.	13.00	4.00	8.00
2497-20	Mixed Feed	Brookport Milling Co.	15.19	3.55	6.20
		Brookport, Ill.	15.50	4.60	8.00
4-19	Mixed Feed	Browder Milling Co.	15.50	4.67	7.23
		Fulton, Ky.	15.28	4.68	9.00
770-20	Mixed Feed	Burnside Roller Mills	17.63	3.75	7.18
		Burnside, Ky.	14.25	5.00	9.00
1854-20	Mixed Feed	Cecilian Milling Co.	17.25	4.34	7.33
		Cecilia, Ky.	14.37	4.15	5.00
1854-21	Same	Same	16.50	4.25	7.80
			14.37	4.15	5.00
141-16	Cameron's Feedstuff	Cameron's Mill	18.88	5.28	3.30
		Carrollton, Ky.	14.75	5.16	7.25
1535-19	King Chop Feed	The Colton Bros. Co.	12.63	6.07	9.15
		Bellefontaine, Ohio.	12.00	4.50	6.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
764-20	Jellico Grocery Co. Middlesboro.	Wheat bran, wheat shorts, wheat middlings, ground wheat screenings 3%, corn meal, corn bran	Below guaranty in protein.
763-19	W. P. Upchurch Whitley City.	Wheat bran, wheat middlings, low grade flour, ground and unground screenings 10%, corn bran	Above guaranty in fiber.
342-19	Mfrs. Warehouse.	Wheat bran, corn bran, unground wheat screenings 3%	
342-20	Same	Same	Excess of screenings. Contains cheat and chaff.
166-19	Consolidated Coal Co. McRoberts.	Wheat middlings, feed meal, wheat bran, ground wheat screenings 5%	
166-21	H. K. Moore Louisa.	Same	Unground wheat screenings present.
751-19	Russellville Feed Co. Russellville.	Wheat bran, corn bran, ground wheat screenings 3%	Above guaranty in fiber.
751-20	C. Howard Russellville.	Same	Same.
769-20	Crab Orchard Milling Co. Crab Orchard.	Wheat bran, wheat middlings, ground wheat screenings 5%, corn bran	Unground wheat screenings present.
843-19	E. P. Barnes & Bros. Beaver Dam.	Wheat bran, shipstuff, corn bran 2%, ground wheat screenings 5%	More corn bran present than guaranteed.
144-19	Mfrs. Warehouse	Wheat bran, wheat middlings, corn bran	Ground wheat screenings present.
623-20	Mfrs. Warehouse	Wheat bran, wheat shorts, corn bran, ground wheat screenings 3%	Unground wheat screenings present.
2686-20	F. K. Tribble Danville.	Wheat bran, wheat shorts, corn bran, ground wheat screenings 5%	
2686-20	J. F. Griffin Mt. Vernon.	Same	
96-17	Lam Mercantile Co. Central City.	Shipstuff, wheat bran, hominy feed, ground wheat screenings 1%	
2497-20	J. R. Brandon Benton.	Wheat bran, shipstuff, corn bran, ground wheat screenings 8%	Below guaranty in fat.
4-19	Mfrs. Warehouse	Soft winter wheat bran, soft winter wheat middlings, corn bran, ground wheat screenings 7½%	
770-20	Same	Wheat bran, corn bran, unground wheat screenings 1%	Below guaranty in fat.
1854-20	Lam Mercantile Co. Central City.	Wheat bran, shorts, corn, corn bran	Above guaranty in fiber. Ground wheat screenings present.
1854-21	Fortney & Pulley Central City.	Same	Above guaranty in fiber.
141-16	Mfrs. Warehouse	Wheat bran, corn bran	
1535-19	Consolidated Coal Co. Von Lear.	Reground corn bran, corn meal, wheat bran	Above guaranty in fiber. Contains ground oats.

TABLE II.—MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1535-20	King Chop Feed	Colton Bros. Co.	11.13	4.30	7.37
		Bellefontaine, Ohio.	**12.00**	**4.50**	**6.00**
848-19	Mixed Feed	Crab Orchard Milling Co.	15.00	4.67	7.93
		Crab Orchard, Ky.	**15.22**	**4.28**	**8.50**
848-19	Same	Same	16.25	3.89	7.21
			15.22	**4.28**	**8.50**
848-20	Same	Same	17.25	4.49	8.84
			15.22	**4.28**	**8.50**
1916-20	Mixed Feed	Crescent Milling Co.	16.50	5.00	7.80
		Cynthiana, Ky.	**15.25**	**4.50**	**9.00**
669-18	Mixed Feed	J. W. Davis	15.45	4.55	9.18
		Elkton, Ky.	**15.78**	**4.83**	.....
319-20	Dorsel's Special Feed	The Dorsel Co.	14.75	4.71	8.20
		Newport, Ky.	**15.00**	**4.00**	**8.00**
319-20	Same	Same	14.00	5.00	10.43
			15.00	**4.00**	**8.00**
254-18	Mixed Feed	Eagle Mills	16.25	5.02	9.23
		Franklin, Ky.	**15.18**	**5.10**	**8.50**
254-18	Mixed Feed	Eagle Mills	15.25	5.76	7.51
		Franklin, Ky.	**15.18**	**5.10**	**8.50**
1188-19	Mixed Feed	T. M. Ellis & Co.	14.88	4.56	7.88
		Russellville, Ky.	**15.00**	**4.60**	**8.00**
1188-21	Same	Same	13.50	4.14	4.65
			15.00	**4.60**	**8.00**
1503-20	Mixed Feed	W. M. Farless	15.31	5.05	7.90
		Henderson, Ky.	**15.00**	**4.00**	**9.00**
1503-20	Same	Same	15.50	4.82	10.54
			15.00	**4.00**	**9.00**
826-19	Mixed Feed	Farmers Milling Co.	14.50	4.00	7.50
		Somerset, Ky.	**15.00**	**4.25**	**8.25**
895-20	Mill Feed	Farmers Union Mill	15.13	4.79	8.55
		Versailles, Ky.	**15.25**	**4.25**	**8.70**
890-20	Mixed Feed	Flemingsburg Mills	16.63	4.56	6.83
		Flemingsburg, Ky.	**13.50**	**4.00**	**9.50**
3070-20	Common Sense Feed	Henry Fruechtenicht	12.31	6.14	6.01
		Louisville, Ky.	**13.00**	**5.60**	**8.00**
401-19	Mixed Feed	Gallatin Milling Co.	14.75	5.01	7.05
		Gallatin, Tenn.	**15.00**	**4.00**	**7.50**
401-21	Same	Same	14.94	4.23	7.40
			15.00	**4.00**	**7.50**
259-19	Mixed Feed	Garrard Milling Co.	14.13	5.13	8.30
		Lancaster, Ky.	**14.00**	**4.75**	**8.50**
259-21	Same	Same	13.13	4.40	5.60
			14.00	**4.75**	**8.50**
909-19	Glass Hi-Grade Feed	Glass Milling Co.	15.75	4.95	8.18
		Wilmore, Ky.	**16.32**	**4.25**	**7.44**
909-20	Same	Same	15.75	5.22	7.70
			16.32	**4.25**	**7.44**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1535-19	Louisa Flour & Feed Co. Louisa.	Wheat bran, reground corn bran, corn meal	Below guaranty in protein and above in fiber. Adulterated with oat hulls and oat middlings.
848-19	Mfrs. Warehouse	Wheat bran, wheat shorts, corn bran	
848-19	W. H. Brown.......... Mt. Vernon.	Same	
848-20	M. S. Burton........... Mt. Vernon.	Same	
1916-20	Wm. Addams........... Cynthiana.	Corn bran, soft winter wheat bran, soft winter wheat middlings........	
669-18	Mfrs. Warehouse	Wheat bran, middlings, corn bran	
319-20	Miss L. Kuechler...... Ft. Thomas.	Wheat middlings, fine corn bran 10%	Excess of ground wheat bran. Feed is wormy.
319-20	Mfrs. Warehouse	Same	Below guaranty in protein and above in fiber.
254-18	Same	Soft winter wheat bran, corn bran	Above guaranty in fiber.
254-18	Park City Feed Store... Bowling Green.	Soft winter wheat bran, corn bran	
1188-19	Mfrs. Warehouse	Wheat bran, corn bran, ground wheat screenings 2%	Excess screenings.
1188-21	Same	Same	Below guaranty in protein.
1503-20	T. F. Hart .... Henderson.	Wheat bran, corn bran, ground wheat screenings 3%	Unground wheat screenings present.
1503-20	J. O. Speed .... Madisonville.	Wheat bran, corn bran 5%, ground wheat screenings 3%.............	Above guaranty in fiber.
826-19	H. C. Gann .... Somerset.	Wheat bran, wheat shorts, corn bran, ground wheat screenings 8%	
895-20	Powell-Hackney Grocery Co., Hazard.	Wheat bran, wheat middlings, ground wheat screenings, 5%, corn bran ..	
890-20	Mfrs. Warehouse	Wheat bran, corn bran	
3070-20	Bell Grocery Co. .... Pineville.	Wheat bran, hominy feed	Below guaranty in protein.
401-19	Franklin Elevator & Warehouse Co., Fklyn.	Wheat bran, wheat shorts, ground wheat screenings 15%, corn bran ..	
401-21	Same	Same	
259-19	Mfrs. Warehouse	Wheat bran, wheat shorts, corn bran, ground wheat screenings 3%	
259-21	J. T. Cherry .... Crab Orchard.	Same	Below guaranty in protein. Wheat screenings present.
909-19	Mfrs. Warehouse	Wheat bran, wheat middlings, shipstuff, corn bran, ground wheat screenings 3%	Below guaranty in protein and above in fiber.
909-20	Same	Same	Below guaranty in protein.

TABLE II.—MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1754-19	Mixed Feed	Gordonsville Milling Co.	15.75	4.48	7.78
		Gordonsville, Ky.	14.41	5.03	8.25
1210-18	Mixed Feed	Green Bros.	16.63	4.43	8.82
		Falls of Rough, Ky.	15.36	4.41	9.25
50-20	H. R. M. Feed	Hanson Roller Mills	14.50	4.81	7.60
		Hanson, Ky.	14.67	4.31	8.25
961-20	Mixed Feed	Hardinsburg Mill & Elevator	12.75	4.56	10.19
		Co., Hardinsburg, Ky.	14.75	4.25	9.75
71-19	Feed Stuff	Harlan-Lowe Milling Co.	16.50	4.40	8.08
		Bardwell, Ky.	14.22	4.20	8.00
71-19	Same	Same	16.00	4.80	9.15
			14.22	4.20	7.80
71-21	Same	Same	14.06	4.69	7.75
			14.22	4.20	8.00
2896-20	Economy Feed	Haydon Mill & Grain Co.	15.75	3.08	4.86
		Springfield, Ky.	15.25	4.50	10.00
1489-18	Lincoln	Hodgensville Roller Mills	15.00	5.05	8.00
		Hodgensville, Ky.	15.00	3.90	8.25
480-20	Happy Home Mixed Feed	Home Milling Co.	15.50	5.92	8.15
		Greenville, Ky.	14.22	5.14	8.23
480-20	Same	Same	17.63	4.64	6.90
			14.22	5.14	8.23
174-16	Mixed Feed	Horse Cave Mills	15.00	5.52	7.25
		Horse Cave, Ky.	14.87	3.78	8.25
174-16	Same	Same	15.63	4.83	8.04
			14.87	3.78	8.25
3008-20	Mixed Feed	Hustonville Roller Mills	16.13	4.28	6.33
		Hustonville, Ky.	14.30	3.90	10.40
3359-21	Illinois Rich Mix Feed	Illinois Feed & Elevator Co.	11.63	4.15	4.01
		Bloomington, Ill.	12.50	4.50	7.00
158-19	Mixed Feed	R. U. Kevil & Sons	15.25	4.73	9.58
		Mayfield, Ky.	14.50	4.95	7.87
500-19	Same	R. U. Kevil & Sons	16.13	4.96	9.16
		Princeton, Ky.	15.00	4.25	8.50
324-19	Mixed Feed	Kuttawa Milling Co.	13.15	4.90	7.10
		Kuttawa, Ky.	13.90	3.52	8.50
324-20	Same	Same	14.88	5.14	6.52
			13.90	3.52	8.50
324-21	Same	Same	13.94	4.58	6.75
			13.90	3.52	8.50
2800-20	Red Tag Feed	Ladish Milling Co.	11.00	2.85	5.00
		Milwaukee, Wis.	11.00	2.00	6.00
752-19	Mixed Feed	Lancaster Elevator & Flour	17.38	5.03	8.58
		Mills, Lancaster, Ky.	16.00	5.38	9.00
752-20	Same	Same	15.88	5.49	7.22
			16.00	5.38	9.00
752-21	Same	Same	15.13	4.33	7.12
			16.00	5.38	9.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1754-19	G. W. Miller Elkton.	Wheat bran, corn bran, whole wheat screenings 2%	Below guaranty in fat.
1210-18	J. D. Ashcraft Irvington.	Wheat bran, corn bran, ground wheat screenings 1%, middl'gs	
50-20	N. I. Toombs Madisonville.	Wheat bran, corn bran, ground wheat screenings 4%	
961-20	Gray & Trent Irvington.	Wheat bran, shipstuff, corn bran, ground wheat screenings 5%	Inferior feed. Below guaranty in protein and above in fiber.
71-19	Mfrs. Warehouse	Wheat bran, corn bran, unground wheat screenings 3%	
71-19	J. A. Atkins	Same	Above guaranty in fiber.
71-21	J. W. Moss Bardwell.	Wheat bran, corn bran, ground and unground wheat screenings 3%	
2896-20	Kalarama Farms Springfield.	Wheat bran, wheat middlings, corn bran	Below guaranty in fat.
1489-18	Mfrs. Warehouse	Wheat bran, shorts, corn bran	
480-20	Elkin & Kimmel Greenville.	Wheat bran, corn bran, ground wheat screenings 5%	
480-20	Same	Same	
174-16	Mfrs. Warehouse	Wheat bran, shorts, corn bran	
174-16	C. L. Jewell Horse Cave.	Same	
3008-20	Mfrs. Warehouse	Wheat bran, wheat shorts, corn bran, ground wheat screenings 15%	
3359-21	Edw. M. Riedling Louisville.	Wheat bran, wheat middlings, red dog flour, corn flour	Below guaranty in protein.
158-19	Mfrs. Warehouse	Wheat bran, corn bran, shorts, ground wheat screenings 3%	Above guaranty in fiber.
500-19	A. Koltinsky Princeton.	Wheat bran, corn bran, ground wheat screenings 4%	Same.
324-19	Mfrs. Warehouse	Shipstuff, corn bran, wheat bran	Below guaranty in protein.
324-20	Same	Same	
324-21	Same	Same	
2800-20	Consolidated Grocery Co. Olive Hill.	Wheat middlings, ground wheat screenings 10%, corn flour	Red dog flour, corn meal instead of corn flour present.
752-19	Mfrs. Warehouse	Wheat bran, corn bran	
752-20	Geo. P. Taylor Co. Somerset.	Same	
752-21	Mfrs. Warehouse	Same	Below guaranty in protein and fat. Contains screenings.

TABLE II.—MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
397-19	Thoroughbred Feed	Lexington Roller Mills	15.88	4.33	9.18
		Lexington, Ky.	**16.38**	**4.15**	**7.09**
397-21	Same	Same	16.06	4.15	6.35
			15.50	**4.50**	**8.00**
287-20	Ideal Cow Feed	Lone Mountain Milling Co.	15.00	5.95	8.13
		Middlesboro, Ky.	**14.00**	**4.00**	**7.00**
403-20	Jersey Cream Feed	Loudon Milling Co.	12.75	4.15	9.55
		Loudon, Tenn.	**13.00**	**4.00**	**11.72**
406-19	Nonesuch Feed	Louisville Cereal Mill Co.	12.00	6.99	5.71
		Louisville, Ky.	**11.62**	**6.00**	**6.50**
406-20	Same	Same	12.25	7.27	5.98
			11.62	**6.00**	**6.50**
406-20	Same	Same	11.63	4.58	4.12
			11.62	**6.00**	**6.50**
1127-18	Mixed Feed	Lynn Milling Co.	16.38	4.86	9.32
		Hodgensville, Ky.	**11.50**	**2.50**	**11.00**
1051-20	Mixed Feed	L. D. McCarley & Co.	16.25	4.35	7.05
		Auburn, Ky.	**15.75**	**4.25**	**8.10**
1073-20	Mixed Feed	McKinney Milling Co.	18.00	4.56	7.13
		McKinney, Ky.	**13.80**	**5.15**	**8.75**
1073-20	Same	Same	17.00	4.87	8.38
			13.80	**5.15**	**8.75**
2241-19	"Bob White" Mixed Feed	Madisonville Milling Co.	16.13	5.11	9.26
		Madisonville, Ky.	**13.50**	**4.75**	**9.25**
1072-20	Mill Feed	Madison Milling Co.	15.50	6.16	7.38
		Richmond, Ky.	**14.00**	**4.25**	**8.50**
1319-19	Mixed Feed	Model Mills, Ward Bros.,	15.63	4.38	8.43
		Proprs., Georgetown, Ky.	**15.69**	**4.56**	**8.50**
283-19	Mixed Feed	Monarch Milling Co.	16.25	4.24	8.65
		Mt. Sterling, Ky.	**14.76**	**4.15**	**8.25**
1956-19	White Rose Mixed Feed	Morganfield Roller Mills	16.63	4.51	8.37
		Morganfield, Ky.	**12.00**	**4.00**	**10.00**
1956-19	Same	Same	16.75	4.41	8.77
			12.00	**4.00**	**10.00**
1081-19	Fine Feed	Mountain City Mill Co.	15.13	4.85	7.50
		Chattanooga, Tenn.	**11.00**	**5.00**	**8.00**
1081-20	Same	Same	15.38	4.35	6.40
			15.00	**7.75**	**8.00**
1081-20	Same	Same	15.25	4.85	5.94
			15.00	**7.75**	**8.00**
260-19	Mixed Feed	Murray Milling Co.	14.25	5.58	9.19
		Murray, Ky.	**15.00**	**4.00**	**8.25**
1130-20	Mixed Feed	New Haven Mill Co.	16.75	4.34	8.65
		New Haven, Ky.	**15.25**	**4.25**	**8.00**
1131-19	Mixed Feed	W. N. Neville	15.38	3.93	7.55
		Arlington, Ky.	**15.00**	**3.00**	**7.98**

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
397-19	Bryant Bros. Whitley City.	Wheat bran, wheat middlings, ground wheat screenings 3%	Below guaranty in protein and above in fiber.
397-21	Kentucky River Coal & Feed Co., Irvine.	Wheat bran, wheat middlings, ground wheat screenings 3%, corn bran 2%.	
287-20	Mfrs. Warehouse	Wheat bran, wheat shorts, ground wheat screenings 6%, corn bran, corn feed meal	Above guaranty in fiber.
403-20	Jellico Grocery Co. Harlan.	Wheat bran, wheat shorts, corn meal, rice bran	
406-19	Joe Lovett Williamsburg.	Hominy meal, wheat bran	
406-20	Same	Same	
406-20	Harlan Grocery & Grain Co., Harlan.	Same	Below guaranty in fat.
1127-18	Woosley & Son Elizabethtown.	Wheat bran, wheat middlings, corn bran	
1051-20	Mfrs. Warehouse	Wheat bran, wheat shorts, corn bran, ground wheat screenings 3%	Contains unground wheat screenings.
1073-20	Geo. P. Taylor Co. Burnside.	Wheat bran, wheat shorts, corn bran	Below guaranty in fat.
1073-20	Mfrs. Warehouse	Same	
2241-19	Same	Soft winter wheat shipstuff, soft winter wheat bran, corn bran, cheat 5%	
1072-20	Kentucky River Coal & Feed Co., Irvine.	Wheat bran, corn bran, ground wheat screenings 5%	
1319-19	Mfrs. Warehouse	Wheat bran, wheat middlings, corn bran, ground wheat screenings 3%	
283-19	Same	Wheat bran, wheat middlings, corn bran	
1956-19	Same	Wheat bran, corn bran, unground wheat screenings 3%	
1956-19	Wilson Grocery Co. Corydon.	Wheat bran, corn bran, unground wheat screenings 3%	
1081-19	Sharp & McCreary Corbin.	Wheat shorts, ground wheat and corn screenings 2%, wheat middlings, hominy feed, wheat bran, corn heart meal	
1081-20	Corbin Fruit Co. Corbin.	Wheat shorts, wheat middlings, ground wheat bran, ground wheat screenings 2%, corn bran, hominy feed, corn oil cake, corn meal	Below guaranty in fat.
1081-20	Smith Grocery Co. Harlan.	Same	Same.
260-19	Mfrs. Warehouse	Wheat bran, wheat middlings, corn bran 10%	Below guaranty in protein and above in fiber.
1130-20	Same	Wheat bran, wheat shorts, corn bran	Above guaranty in fiber.
1131-19	Mfrs. Warehouse	Wheat bran, wheat shorts, corn bran, unground wheat screenings 1%	

TABLE II.—MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1131-21	Mixed Feed	W. N. Neville	14.13	3.32	9.10
		Arlington, Ky.	15.00	3.00	7.98
1305-19	Mixed Feed and Screenings	Oakland Milling Co.	14.75	4.08	6.95
		Oakland, Ky.	15.00	4.25	9.50
1305-19	Same	Same	15.00	4.49	6.60
			15.00	4.25	9.50
3160-20	White Middo Feed	Ohio Milling & Feed Co.	11.88	5.40	4.56
		Youngstown, Ohio.	11.00	3.50	8.00
2743-20	Mill Feed	Oneida Milling Co.	15.25	5.85	7.07
		Oneida, Tenn.	15.25	4.50	8.75
2743-20	Same	Same	14.75	6.08	6.88
			15.25	4.50	8.75
1711-20	Mixed Feed	Paris Milling Co.	15.75	4.09	8.20
		Paris, Ky.	15.00	4.75	10.00
1711-20	Same	Same	16.00	4.38	6.90
			15.00	4.75	10.00
929-19	Mixed Feed	Park City Milling Co.	16.25	4.21	8.10
		Bowling Green, Ky.	15.19	4.17	8.50
929-20	Same	Same	14.69	5.50	6.75
			15.19	4.17	8.50
2050-20	Mixed Feed	Parksville Roller Mills	16.00	3.97	5.73
		Parksville, Ky.	13.81	4.18	9.75
1935-18	Mixed Feed	Pee Pee Milling Co.	13.25	3.28	4.93
		Waverly, Ohio.	14.30	3.90	7.30
1268-20	Mill Feed	Peoples Roller Mills Co.	15.38	4.71	6.60
		Georgetown, Ky.	14.50	4.10	8.25
1268-21	Same	Same	16.13	5.03	6.15
			14.50	4.10	8.25
87-20	Standard Feed	The R. C. Poage Milling Co.	14.88	5.01	8.83
		Ashland, Ky.	13.94	4.78	8.08
87-20	Same	Same	15.38	3.00	3.60
			13.94	4.78	8.08
3233-21	Blue Grass Farm Feed	Poage-Wall Milling Co.	15.56	4.81	7.30
		Catlettsburg, Ky.	14.00	4.78	8.00
1216-20	Mixed Feed	R. L. Potts & Son	14.75	6.23	8.39
		Whites Station, Ky.	12.00	3.00	8.75
1216-20	Same	Same	14.88	5.79	8.35
			12.00	3.00	8.75
18-19	Mixed Feed	Rockport Milling Co.	16.25	4.53	7.48
		Rockport, Ind.	14.44	4.20	8.03
3261-21	Mill Feed	Sadieville Milling Co.	17.63	4.22	6.85
		Sadieville, Ky.	15.25	4.00	8.50
1163-19	‘‘S. H. M. Co.’’ Feed	Science Hill Milling Co.	14.06	6.13	9.74
		Science Hill, Ky.	14.50	5.69	9.43
2888-20	Mixed Feed	Scottsville Milling Co.	15.38	4.56	7.62
		Scottsville, Ky.	15.25	4.45	10.00
2391-20	Security Fine Feed	Security Mills & Feed Co.	15.38	4.25	9.02
		Knoxville, Tenn.	14.50	4.00	8.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1131-21	Joseph Mike Mayfield.	Wheat bran, wheat shorts, corn bran, unground wheat screenings 1%	Below guaranty in protein and above in fiber. Contains cheat.
1305-19	Park City Feed Store Bowling Green.	Wheat bran, wheat shorts, corn bran, ground wheat screenings 15%	
1305-19	Same	Same	
3160-20	C. W. Wheeler & Co. Paintsville.	Wheat middlings, white corn flour	
2743-20	Martha Swain Pine Knot.	Wheat shorts, wheat bran, ground wheat, screenings 5%, corn bran, corn screenings 2%	
2743-20	Bryant Bros. Whitley City.	Same	Below guaranty in protein.
1711-20	S. B. Bentley Fleming.	Soft winter wheat bran, wheat shorts, wheat middlings, corn bran	Below guaranty in fat.
1711-20	Percival & Coffman Walton.	Soft winter wheat bran, wheat shorts, wheat middlings, corn bran	Wheat screenings present.
929-19	Sam Nahm & Co. Bowling Green.	Wheat bran, shorts, corn bran, unground wheat screenings 5%	
929-20	Park City Milling Co. Bowling Green.	Wheat bran, shorts, corn bran, ground wheat screenings 5%	Unground wheat screenings containing cheat, oats and chaff.
2050-20	A. L. Harmon Junction City.	Shipstuff, corn bran	
1935-18	Susen Hughes Garrett.	Corn bran, wheat bran, wheat middlings, ground wheat screenings	Below guaranty in protein and fat.
1268-20	Morgan & Crenshaw Georgetown.	Wheat bran, wheat shorts, corn bran	
1268-21	Penn & Parker Georgetown.	Wheat bran, wheat shorts, corn bran	Wheat screenings present.
87-20	Lack-Moore Louisa.	Wheat middlings, wheat bran, corn bran, ground wheat screenings 5%	Above guaranty in fiber.
87-20	Mfrs. Warehouse	Same	Below guaranty in fat. Sample is middlings.
3233-21	C. W. Wheeler & Co. Paintsville.	Wheat middlings, wheat bran, corn bran, ground wheat screenings 5%	
1216-20	R. K. Moberly Moberly.	Wheat bran, wheat middlings, ground wheat screenings 10%, corn bran	
1216-20	Hensley & Cornett Berea.	Same	
18-19	L. E. Chapman Owensboro.	Wheat bran, wheat middlings, corn bran, unground wheat screenings 3%	
3261-21	T. L. Hardy Berry.	Shipstuff, corn bran	
1163-19	C. M. Langdon Science Hill.	Wheat middlings, wheat bran, wheat shorts, unground wheat screenings 2%, corn bran	
2888-20	Mfrs. Warehouse	Wheat bran, corn bran, ground wheat screenings 5%	
2391-20	Jones, Bible Co. Harlan.	Wheat shorts, wheat bran, corn meal, corn bran, ground wheat screenings 5%	Above guaranty in fiber.

TABLE II.—MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1882-19	Cream Patent Feed	Sebree Roller Mills	15.25	4.45	10.49
		Sebree, Ky.	**15.43**	**4.28**	**9.50**
1882-20	Same	Same	16.00	4.60	7.10
			15.43	**4.28**	**9.50**
1882-20	Same	Same	15.13	4.34	10.98
			15.43	**4.28**	**9.50**
1882-20	Same	Same	16.00	3.99	7.98
			15.43	**4.28**	**9.50**
900-20	So-Mil-Co. Mixed Feed	Somerset Milling Co.	15.75	5.57	7.00
		Somerset, Ky.	**15.00**	**4.75**	**7.40**
900-20	Same	Same	15.00	4.87	7.21
			15.00	**4.75**	**7.40**
495-20	Mixed Feed	Sonora Milling Co.	15.00	4.05	13.37
		Sonora, Ky.	**14 50**	**4.00**	**9.65**
495-19	Mixed Feed	Sonora Milling Co.	15.25	4.33	7.58
		Sonora, Ky.	**14.50**	**4.00**	**9.65**
495-19	Same	Same	16.25	5.30	7.35
			14.50	**4.00**	**9.65**
499-19	Mixed Feed	Southern Star Roller Mills	15.25	4.25	6.35
		Perryville, Ky.	**14.60**	**5.18**	**8.00**
499-19	Same	Same	14.88	4.01	5.88
			14.60	**5.18**	**8.00**
1194-20	Mixed Feed	E. F. Spears & Sons	16.13	4.85	9.11
		Paris, Ky.	**14.50**	**4.50**	**7.50**
2695-20	Mixed Feed	Stafford Milling Co.	13 63	6 15	9.79
		Martin, Tenn.	**15.56**	**4.73**	**7.78**
1638-18	Mixed Feed	Stahl & Rudolph	16.00	5 12	7.65
		Barlow, Ky.	**14.00**	**4.00**	**8.25**
726-18	Tip Top Feed	Star Milling Co.	13.13	5.08	9.65
		Nicholasville, Ky.	**14.41**	**3.71**	**7.54**
1624-21	Same	Same	15.88	3.62	7.15
			16.00	**3.71**	**7.54**
1465-19	Mixed Feed	Star Milling Co.	14.50	4.40	9.30
		Clinton, Ky.	**15.25**	**4.00**	**8.50**
1465-20	Same	Same	15.75	4.35	8.25
			14 25	**4.40**	**9.50**
325-19	Mixed Feed	Star Roller Mills	16.00	4.48	7.75
		Cloverport, Ky.	**14.50**	**4.25**	**9.25**
2984-20	Wavoto Standard Feed	The Stritmatter Grain & Milling Co., Waverly, Ohio.	14.75	4 78	9.03
			13.30	**5.10**	**8.50**
1313-19	A Mixed Feed	Tell City Flouring Mills	15.50	4.43	7.50
		Tell City, Ind.	**14.00**	**4.00**	**9.00**
1313-20	Same	Same	15.50	4.40	7.82
			14.00	**4.00**	**9.00**
343-19	Thompson's Mixed Feed	Thompson's Mill	15.25	4 94	8.61
		Madisonville, Ky.	**15.00**	**4.75**	**9.00**
73-20	Monogram Feed	Town Creek Milling Co.	13.75	5.07	8.17
		Lenoir City, Tenn.	**15.00**	**4.00**	**8.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1882-19	Mfrs. Warehouse	Wheat bran, corn bran, unground wheat screenings 5%	Above guaranty in fiber.
1882-20	Henderson Feed & Commission Co., Henderson.	Same	
1882-20	Same	Same	Above guaranty in fiber.
1882-20	Mfrs. Warehouse	Same	
900-20	R. T. Elliott Somerset.	Wheat bran, wheat middlings, corn bran, ground wheat screenings 5%	
900-20	Mfrs. Warehouse	Same	
495-20	Rider & Wheeler Upton.	Wheat bran, wheat shorts, corn bran, ground wheat screenings 3%	Above guaranty in fiber. Adulterated with oat hulls.
495-19	Mfrs. Warehouse	Wheat bran, wheat shorts, corn bran	
495-19	H. W. McCandless Munfordville.	Same	
499-19	F. K. Tribble Danville.	Wheat bran, shipstuff, corn bran, ground wheat screenings 5%	Below guaranty in fat.
499-19	Same	Same	Below guaranty in fat.
1194-20	Geo. S. Ware Clay City.	Wheat bran, wheat shorts, wheat middlings, corn bran 5%, ground wheat screenings 3%	Above guaranty in fiber.
2695-20	McKeel & Thurmond Murray.	Wheat bran, corn bran, screenings 2%	Below guaranty in protein and above in fiber. Excess of corn bran. Inferior to guarantee.
1638-18	G. F. Phillips Paducah.	Wheat bran, corn bran, unground wheat screenings 5%	
726-18	Mfrs. Warehouse	Wheat bran, wheat shorts, wheat middlings, corn bran, ground wheat screenings 3%	Below guaranty in protein and above in fiber.
1624-21	Farmers Coal, Grain & Feed Co., Nicholasville.	Same	
1465-19	Mfrs. Warehouse	Soft winter wheat bran, soft winter wheat middlings, corn bran, ground wheat screenings 2%	Below guaranty in protein and above in fiber.
1465-20	Rogers & Roper Hickman.	Same	
325-19	J. H. Brown Cloverport.	Wheat bran, wheat middlings, corn bran, wheat screenings 5¼%	
2984-20	N. D. Tabor Olive Hill.	Wheat middlings, ground wheat screenings 2%, corn bran, wheat bran	Above guaranty in fiber. Ground corn present.
1313-19	A. D. Ashcraft Irvington.	Wheat bran, wheat middlings, corn bran, ground wheat screenings 5%	
1313-20	W. C. Kelly Hawesville.	Same	
343-19	W. S. Hibbs Madisonville.	Soft winter wheat shipstuff, soft winter wheat bran, corn bran, wheat screenings 3%	
73-20	Jellico Grocery Co. Barboursville.	Wheat bran, wheat shorts, corn bran, corn meal, corn and wheat screenings 10%	Below guaranty in protein.

TABLE II.— MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2050-18	Mixed Feed	Uniontown Roller Mills Co.	14.88	4.23	9.30
		Uniontown, Ky.	13.66	4.50	8.15
1850-18	Concentrated Feed Stuff	Vine Grove Roller Mills	17.25	4.43	6.56
		Vine Grove, Ky.	14.00	4.50	10.00
1226-20	Cream Feed	Phil J. Weisenberger & Son	14.88	5.17	10.25
		Midway, Ky.	14.71	5.16	8.25
1677-20	Williams Feed	Williams & Co.	15.00	3.84	5.59
		Sanders, Ky.	15.00	3.00	8.50
22-20	Mixed Feed	Winchester Roller Mills	17.13	4.01	6.02
		Winchester, Ky.	15.50	4.00	7.50
22-20	Same	Same	16.13	4.06	6.59
			15.50	4.00	7.50
22-20	Same	Same	16.13	4.67	7.66
			15.50	4.00	7.50
22-20	Same	Same	15.75	4.46	7.47
			15.50	4.00	7.50
1679-20	Mixed Feed	Woodburn Roller Mills	14.25	5.74	7.90
		Woodburn, Ky.	14.50	3.73	7.78
1906-20	Woolcott's Feed	J. F. Woolcott & Co.	16.75	4.85	6.83
		S. Carrollton, Ky.	15.14	4.86	9.50
285-19	Mixed Feed	Woolcott Flour Mills	16.25	4.35	6.69
		Lexington, Ky.	15.50	3.73	7.78
285-20	Same	Same	16.00	4.61	6.87
			15.50	3.73	7.78
285-20	Woolcott's Mixed Feed	Woolcott Flour Mills	15.88	4.35	7.27
		Lexington, Ky.	15.50	3.73	7.78
1564-20	Mixed Feed	Young & Bishop	12.63	4.05	6.26
		Providence, Ky.	13.00	5.00	7.00
1699-19	Bonanza	J. W. Zaring Grain & Mill Co.	15.50	5.34	6.67
		Richmond, Ky.	14.00	3.75	8.40
1699-20	Same	Same	15.50	5.55	6.88
			14.00	3.75	8.40
1699-20	Same	Same	15.63	4.82	8.33
			14.00	3.50	8.40
1699-21	Same	Same	13.63	6.88	6.35
			15.50	4.75	8.50
1699-21	Same	Same	14.38	6.91	6.59
			14.00	3.75	8.40
	Dried Brewer's Grains				
1757-19	Arrow Dried Grains	Edinger & Co.	17.75	5.58	18.96
		Louisville, Ky.	16.00	7.00	21.00
2188-19	Barley Malt and Grits	Falls City Ice & Beverage Co.	21.63	5.45	15.08
		Louisville, Ky.	22.38	7.13	16.38
2000-20	Brewers' Dried Grains	The Highland Dairy Co.	25.50	9.56	14.82
		Newport, Ky.	20.27	5.66	23.52

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2050-18	N. I. Toombs Madisonville.	Shipstuff, wheat bran, corn bran, unground wheat screenings 5%	Above guaranty in fiber.
1850-18	Woosley & Son Elizabethtown.	Wheat bran, corn bran, wheat screenings 3%	
1226-20	W. H. Bowling Torrent.	Wheat bran, corn bran	Above guaranty in fiber.
1677-20	E. L. Goodridge Walton.	Wheat bran, corn bran, middlings	
22-20	Riverside Co. Beattyville.	Wheat bran, corn bran, ground wheat screenings 5%	
22-20	Sam Carr Clay City.	Same	
22-20	Estill Ice Co. Irvine.	Same	
22-20	Isaac Shouse Salt Lick.	Same	
1679-20	Mfrs. Warehouse	Wheat bran, red dog, shorts, corn bran, ground wheat screenings 2%.	No red dog present.
1906-20	Lam Mercantile Co. Central City.	Wheat bran, shipstuff, corn bran, ground wheat screenings 5%	
285-19	T. H. Perry Salt Lick.	Wheat bran, corn bran, wheat shorts, ground wheat screenings 2%, wheat middlings	
285-20	Hardwick & Co. Stanton.	Same	
285-20	Lyle & Co. Stanton.	Wheat bran, wheat shorts, wheat middlings, corn bran, ground wheat screenings 2%	
1564-20	B. J. Benjamin & Son Providence.	Wheat bran, corn bran, ground wheat screenings 5%	Below guaranty in protein and fat.
1699-19	Irvine Ice Co. Irvine.	Wheat bran, wheat middlings, corn bran, ground wheat screenings 5%.	
1699-20	Estill Ice Co. Irvine.	Same	
1699-20	Same	Same	
1699-21	Mrs. Mabel Beatty Beattyville.	Same	Below guaranty in protein.
1699-21	Mfrs. Warehouse	Same	
1757-19	LaGrange Feed & Grain Co., Lagrange.	Dried yeast grains from corn, barley malt, oats malt and sprouts	Below guaranty in fat.
2188-19	J. F. Gauman Louisville.	Barley, malt, grits	Below guaranty in protein and fat.
2000-20	The Highland Dairy Co. Ft. Thomas.	Barley, rice	No rice product present.

TABLE II.—MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
	Mixed Middlings				
2665-20	Fancy White Wheat and Rye Middlings and Screenings	Gwinn Bros. & Co.	13.94	4.50	4.73
		Huntington, W. Va.	**16.00**	**4.00**	**7.50**
1266-19	Lotus Mixed Middlings	Keister Milling Co.	16.00	4.36	7.32
		Huntington, W. Va.	**15.00**	**3.75**	**4.00**
1266-20	Same	Same	16.00	4.69	7.43
			15.00	**3.75**	**4.00**
1266-20	Lotus Wheat and Rye Middlings.	Same	16.25	4.25	5.98
			15.00	**3.75**	**4.00**
1266-20	Same	Same	15.00	5.18	7.49
			15.00	**3.75**	**4.00**
	Palmo Middlings				
1878-20	Palmo Midds	The Newsome Feed & Grain Co., Pittsburg, Pa.	16.63	8.38	7.94
			16.00	**7.00**	**9.00**
1878-20	Same	Same	17.25	8.08	7.76
			16.00	**7.00**	**9.00**
1878-20	Same	Same	15.00	6.33	9.91
			16.00	**7.00**	**9.00**
1878-20	Same	Same	17.00	7.78	7.05
			16.00	**7.00**	**9.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2665-20	Kentucky Wholesale Grocery Co., Pikeville.	Wheat middlings, rye middlings, low grade flour, ground wheat screenings 2%	Below guaranty in protein. Adulterated with corn product. Inferior to guarantee.
1206-19	Lack Moore Louisa.	Wheat middlings, rye middlings.	Screenings present. Above guaranty in fiber.
1266-20	Louisa Flour & Feed Co. Louisa.	Same	Same.
1266-20	Pikeville Grocery Co. Pikeville.	Same	Ground grain screenings and corn bran present. Above guaranty in fiber.
1266-20	Same	Same	Rice hulls and rice bran present. Above guaranty in fiber.
1878-20	Pikeville Grocery Co. Pikeville.	Cleaning wheat middlings, palm oil	
1878-20	R. D. Riedling Louisville.	Wheat middlings, rye middlings, palm oil	
1878-20	Kentucky Wholesale Co. Pikeville.	Same	Below guaranty in both protein and fat and above in fiber.
1878-20	Pulaski County Mill & Grain Co., Somerset.	Cleaning wheat middlings, palm oil.	

TABLE III.—POULTRY FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
	Poultry Feeds				
306-19	Acme Chick Feed	Acme-Evans Co.	10.88	2.83	2.55
		Indianapolis, Ind.	10.00	2.50	5.00
313-20	Acme Dry Mash	Same	18.75	5.75	8.55
			15.50	3.50	7.00
467-21	Alfocorn Scratch Feed	Alfocorn Milling Co.	10.25	3.30	3.15
		St. Louis, Mo.	10.00	3.00	5.00
472-20	Wishbone Scratch Feed	Same	10.00	3.40	3.38
			10.00	2.50	4.00
2562-18	Homco Dry Mash	American Hominy Co.	16.13	6.28	9.84
		Indianapolis, Ind.	12.00	4.00	7.00
2169-19	Eg-A-Day Dry Mash	J. J. Badenoch Co.	17.50	4.53	11.65
		Chicago, Ill.	18.00	3.00	11.00
1717-18	Corno Chick Feed	The Corno Mills Co.	11.25	3.42	3.78
		St. Louis, Mo.	10.00	3.00	3.50
205-20	Nutro Hen Feed	Same	10.50	3.53	2.50
			10.00	3.00	3.50
43-20	Polo Hen Feed	Dixie Mills Co.	10.88	3.30	2.05
		E. St. Louis, Ill.	10.00	3.00	5.00
598-20	Ce-re-a-li-a Egg Mash	The Early & Daniel Co.	21.50	4.81	10.35
		Cincinnati, Ohio.	20.00	5.00	7.50
274-20	Tuxedo Scratch	The Early & Daniel Co.	13.25	3.32	3.16
		Covington, Ky.	10.00	2.50	5.00
1098-19	Arrow Chick Feed (No Grit)	Edinger & Co.	10.38	2.81	3.21
		Louisville, Ky.	10.50	2.75	4.00
1089-20	Arrow Hen Feed (No Grit)	Same	11.00	3.50	3.58
			10.00	3.00	5.00
1974-19	Energy Scratch Feed	Golden Grain Milling Co.	10.75	2.85	2.65
		E. St. Louis, Ill.	10.00	2.00	5.00
1912-18	Golden Grain Scratch Feed	Same	10.13	2.63	4.50
			10.00	3.00	6 00
671-20	Red Comb Chick Mash	Hales & Edwards Co.	16.63	4.06	6.66
		Chicago, Ill.	16.00	4.00	5.00
2998-20	Homestead Scratch Feed	Illinois Feed & Elevator Co.	10.13	3.74	3.20
		Bloomington, Ill.	9.00	3.50	7.00
2670-20	Premo Baby Chick Feed	Kentucky Feed & Grain Co.	11.88	4.34	3.16
		Louisville, Ky.	10.00	2.50	5.00
2619-20	Queen City Scratch Feed	Chas. A. Krause Milling Co.	10.50	3.35	2.95
		Milwaukee, Wis.	9.00	2.50	5.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
306-19	William Addams Cynthiana.	Wheat, corn, kaffir corn, millet	
313-20	Sharp & McCreary Co. Corbin.	Wheat bran, wheat middlings, corn meal, hominy meal, alfalfa meal, beef scraps, oats, oil meal, charcoal	No charcoal found. High in fiber.
467-21	Ruef Bros. Co. Covington.	Corn, wheat, kaffir corn, oats, barley, sunflower seed 2%	
472-20	Same	Cracked corn, kaffir corn, barley	Oats and wheat present.
2562-18	Bush & Prichard Ashland.	Corn germ meal, hominy feed, wheat middlings, wheat bran, meat scraps, alfalfa, molasses, linseed oil meal	Above guaranty in fiber.
2169-19	Geo. Keller Newport.	Fish meal, meat meal, bone, wheat, oats, barley, wheat bran, wheat middlings, alfalfa meal, buckwheat feed, milo maize, corn feed meal, ground grain screenings 5%, calcium phosphate 1%, calcium carbonate 1%, salt	Same.
1717-18	Hurst & Co. Lexington.	Cracked corn, cracked wheat, cracked kaffir corn, cracked rice, whole millet seed	No cracked rice found.
205-20	Same	Wheat, cracked corn, ground wheat screenings 5%, barley oats, kaffir corn	No ground wheat screenings found.
43-20	Geo. Keller Newport.	Wheat, corn, kaffir, milo, barley, sunflower seed, whole wheat screenings 10%	No sunflower seed found.
598-20	Cameron's Mill Carrollton.	Alfalfa leaf meal, linseed oil meal, corn meal, wheat bran, wheat middlings, ground wheat, oatmeal, beef meal	Above guaranty in fiber. Alfalfa meal instead of alfalfa leaf meal present. Tankage and not beef meal present. Ground oats and wheat screenings present.
274-20	E. L. Goodridge Walton.	Cracked corn, oats, barley, sunflower seed, buckwheat, wheat, kaffir corn.	
1098-19	H. B. Ringo Mt. Sterling.	Corn, wheat, millet, kaffir corn, recleaned wheat screenings 3%	Oats present.
1089-20	The Farmers Union Supply Co., Bowling Green	Wheat, milo maize, barley, white clipped oats, sunflower seed, corn, kaffir corn	No barley present.
1974-19	Bell Grocery Co. Pineville.	Wheat, cracked corn, kaffir corn, oats, barley, recleaned wheat screenings 5%, wild buckwheat	
1912-18	Hurst & Co. Lexington.	Corn, wheat, kaffir corn, milo maize, barley, sunflower seed.	Oats present. No sunflower seed present.
671-20	Garrard Lincoln Produce Co., Lancaster.	Corn feed meal, barley flour, dried buttermilk, alfalfa flour, oat flour, gluten feed, meat scraps, bone flour, wheat middlings, calcium carbonate, salt ¼%	No bone flour or buttermilk present. Above guaranty in fiber.
2998-20	J. H. Fedders & Sons Covington.	Cracked corn, wheat, barley, clipped oats, buckwheat, milo maize, sunflower seed	
2670-20	C. L. Jewell Horse Cave.	Wheat, cracked corn, oats, kaffir corn, barley, sunflower seed	Not according to guarantee. Inferior wheat used. Weed seeds present. No barley, oats or sunflower seed present.
2619-20	Kenton Hay & Grain Co. Covington.	Wheat, corn, kaffir corn, barley, oats, buckwheat, unground wheat screenings 2%	

TABLE III.—POULTRY FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2633-20	Nutritia Egg Mash	The Nutritia Co.	20.50	5.10	5.76
		Cincinnati, Ohio.	20.00	4.00	10.00
145-20	Park Scratch Grains	Same	11.88	3.01	2.98
			10.00	3.00	7.00
145-20	Same	Same	10.63	3.69	3.68
			10.00	3.00	7.00
145-20	Same	Same	10.00	3.07	3.40
			10.00	3.00	7.00
146-20	Columbia Little Chick Feed	Same	12.25	3.64	2.90
			10.00	2.50	5.00
146-20	Same	Same	11.13	1.97	3.09
			10.00	2.50	5.00
2268-19	"Opco" Egg Mash	Owensboro Products Co.	17.13	3.64	10.45
		Owensboro, Ky.	18.00	4.50	15.00
1737-19	"O. P. No. 1" Scratch Feed	Same	11.38	3.20	4.65
			10.00	2.50	5.00
1737-19	Same	Same	11.25	2.89	3.38
			10.00	2.50	5.00
1735-19	"Opco" Chick Feed	Same	11.69	3.37	3.78
			10.00	2.50	4.00
1576-19	"Lay or Bust" Dry Mash	The Park & Pollard Co.	20.75	4.09	10.03
		Chicago, Ill.	18.00	1.50	12.00
1576-20	Same	Same	21.38	5.25	8.88
			18.00	1.50	12.00
846-18	Screened Scratch Feed	The Park & Pollard Co.	10.25	4.05	3.20
		Boston, Mass.	10.00	1.50	5.00
1150-19	Baby Buster Chick Feed	The Park & Pollard Co.	11.63	4.11	2.48
		Chicago, Ill.	11.00	2.00	5.00
654-20	Peters Red Feather Poultry Mash with Buttermilk	M. C. Peters Mill Co.	24.13	3.53	7.15
		Omaha, Neb.	20.00	4.00	8.00
2688-20	Early Egg Scratch Feed	Prairie State Milling Co.	11.25	4.10	3.60
		Chicago, Ill.	9.00	3.75	3.50

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2633-20	Ashland Coal & Fire Clay Co., Ashland.	Wheat middlings, hominy meal, bran, linseed oil meal, alfalfa meal, beef scraps, salt	
145-20	Cogar Grain, Coal & Feed Co., Harrodsburg.	Wheat, cracked corn, oats, kaffir corn, sunflower seed, barley	No sunflower seed present. Wheat used is of poor quality. Buckwheat and wheat screenings present.
145-20	S. A. Glass Lexington.	Same	
145-20	T. L. Hardy Berry.	Same	No sunflower seed present. Wild oats and buckwheat present.
146-20	Crown Jewell Milling Co. Cynthiana.	Corn grits, millet, oat groats, cracked wheat, kaffir corn	Contains wheat screenings, weed seeds and pin oats.
146-20	T. L. Hardy Berry.	Same	Below guaranty in fat. Not in accordance with guarantee. No oat groats or kaffir corn present. Cheat, weed seeds and screenings present. Below guaranty in protein.
2208-19	Edw. M. Riedling Louisville.	Wheat middlings, wheat bran, ground oats, corn feed meal, alfalfa meal, meat scraps, linseed oil meal, calcium carbonate 1%	Below guaranty in protein and fat.
1737-19	Corbin Feed & Grocery Store, Corbin.	Cracked corn, wheat, barley, oats, kaffir corn, wild buckwheat, sunflower seed	Barley present.
1737-19	J. C. Everett & Co. Maysville.	Cracked corn, wheat, barley, oats, kaffir corn, wild buckwheat, sunflower seed	No sunflower seed present.
1735-19	Hurst & Co. Lexington.	Cracked corn, wheat, kaffir corn, millet seed	Barley, oats, wild buckwheat, mustard, cockle and screenings found in addition to guaranteed ingredients.
1576-19	Kenton Hay & Grain Co. Covington.	Ground corn, ground wheat, ground oats, ground barley, kaffir corn, buckwheat, alfalfa, fish, bone, wheat bran, wheat middlings, calcium phosphate ½%, salt	No Bone meal or fish meal present. Meat meal present.
1576-20	C. S. Brent Seed Co. Lexington.	Ground wheat, ground barley, ground kaffir corn, corn feed meal, ground milo maize, ground oats, alfalfa meal, ground grain screenings 20%, buckwheat grits, wheat bran, wheat middlings, meat, bone, calcium phosphate ½%, calcium carbonate ½%, dried fish, salt	Ground grain screenings used. Contain weed seeds.
846-18	Geo. Keller Newport.	Cracked corn, buckwheat, oats, milo maize, sunflower seed, wheat, barley, kaffir corn	Wheat screenings present.
1150-19	C. S. Brent Seed Co. Lexington.	Cracked corn, cracked wheat, cracked kaffir corn, whole millet seed, cracked oats, shredded fish	
654-20	I. N. Toombs Madisonville.	Corn feed meal, ground oats, ground barley, wheat bran, wheat middlings, oil meal, meat meal, alfalfa meal, buttermilk	
2688-20	Wm. P. Miller Louisville.	Wheat, cracked corn, barley, kaffir corn, buckwheat, recleaned wheat screenings 10%	

TABLE III.—POULTRY FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2813-20	Early Egg Scratch Feed (With Grit)	Prairie State Milling Co.	10.38	3.40	3.13
		Chicago, Ill.	9.00	3.75	3.50
2679-20	Iowa Scratch Feed	Purity Oats Co.	11.25	3.82	3.08
		Davenport, Iowa.	10.00	3.25	5.00
834-19	Ful-O-Pep Dry Mash	The Quaker Oats Co.	22.50	5.85	8.54
		Chicago, Ill.	20.00	4.00	10.00
834-19	Same	Same	22.00	5.83	9.03
			20.00	4.00	10.00
1337-19	Ful-O-Pep Growing Mash	Same	20.50	5.00	5.80
			17.00	5.25	9.00
1337-19	Same	Same	20.38	5.00	4.65
			17.00	5.25	9.00
294-19	Purina Chicken Chowder Feed	Ralston Purina Co.	21.38	4.93	10.05
		St. Louis, Mo.	19.00	4.00	10.00
294-19	Same	Same	19.00	4.58	10.50
			19.00	4.00	10.00
297-20	Purina Chicken Fatena Feed	Same	14.19	6.23	8.25
			12.00	6.00	9.00
297-20	Same	Same	15.75	7.63	8.60
			12.00	6.00	9.00
296-20	Purina Scratch Feed	Same	10.75	3.31	2.53
			10.00	2.50	4.00
293-19	Purina Chick Feed	Same	11.75	3.07	2.58
			10.00	2.50	5.00
2652-20	Rapier's Blue Hen Scratch Feed	Rapier Sugar Feed Co.	11.13	3.13	2.70
		Owensboro, Ky.	10.00	2.00	5.00
1762-20	Rapier's Blue Hen Baby Chick Feed	Same	11.88	3.40	2.13
			10.00	2.00	5.00
1848-19	‘‘77’’ Scratch Feed	Rosenbaum Bros.	10.25	3.71	5.10
		Chicago, Ill.	9.00	2.00	7.00
940-20	Eureka Little Chick Feed	Royal Feed & Milling Co.	12.50	4.03	6.26
		Memphis, Tenn.	10.00	2.00	5.00
129-20	Mixo Hen Feed	Same	8.38	2.86	2.59
			10.00	2.00	5.00
129-20	Same	Same	9.25	2.66	3.31
			10.00	2.00	5.00
128-19	Sunrise Hen Feed	Same	11.13	2.80	3.38
			10.00	2.00	5.00
2475-20	Simco Egg Mash with Buttermilk	Simmons Milling Co.	15.75	4.74	9.13
		Cincinnati, Ohio.	18.00	4.00	10.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2813-20	E. L. Martin & Co. Lexington.	Wheat, cracked corn, barley, kaffir corn, buckwheat, recleaned wheat screenings, grit 5%	Weed seeds present.
2679-20	Bryant-Hunt Co. Lexington.	Cracked corn, hulled oats, kaffir corn, barley, buckwheat, sunflower seed	
834-19	Qualls & Dennes Olive Hill.	Meat scraps, fish meal, oat meal, alfalfa meal, wheat bran, hominy feed, yellow hominy feed, corn gluten feed, ground grain screenings 10%, bone meal, cotton seed meal	No fish meal present.
834-19	J. A. Shaver Greenville.	Same	Same.
1337-19	Same	Meat scraps, oil meal, fish meal, corn gluten feed, hominy feed, yellow hominy feed, wheat bran, alfalfa meal, bone meal, ground puffed wheat, ground corn puffs	No corn gluten feed or fish meal present.
1337-19	A. Schneider's Sons Louisville.	Same	
294-19	Carter Supply Co. Lexington.	Wheat middlings, wheat bran, gluten feed from corn, corn meal, alfalfa flour, linseed flour, granulated meat, salt 1%, charcoal 1%	
294-19	J. B. Blanton & Co. Frankfort.	Same	
297-20	Toohey Bros. Winchester.	Ground oats, ground corn, kaffir meal, barley meal, corn germ meal, wheat middlings, linseed flour, ground sunflower seed	
297-20	Geo. P. Taylor Co. Burnside.	Same	No barley meal, wheat middlings or ground sunflower seed present.
296-20	Carter Supply Co. Lexington.	Wheat, corn, barley, kaffir, milo, buckwheat, sunflower seed	
293-19	Same	Wheat, corn, kaffir, milo, millet.	
2652-20	American Co-operative Association, Fordsville.	Corn, wheat, barley, oats, kaffir, sunflower seed	Wheat damaged.
1762-20	Vine Grove Feed Co. Vine Grove.	Cracked corn, cracked wheat, cracked kaffir corn	Wheat damaged. Weed seeds present.
1848-19	J. O. Speed Madisonville.	Sifted cracked corn, barley, oats wheat, kaffir corn, buckwheat.	
940-20	Jabour Bros. Mayfield.	Cracked corn, wheat, milo	Adulterated with weed seeds and screenings. Above guaranty in fiber.
129-20	Covington Bros. & Co. Murray.	Cracked shelled corn, oats, milo, wheat screenings 25%, grit 7%	Below guaranty in protein. Barley present.
129-20	Jabour Bros. Mayfield.	Same	Same.
128-19	Covington Bros. & Co. Murray.	Wheat, cracked shelled corn, oats, barley, barley screenings, 10%, wheat screenings 15%	Large percent kaffir corn present but not guaranteed.
2475-20	Geo. P. Taylor Co. Burnside.	Powdered dried buttermilk, wheat bran, wheat middlings, ground oats, hominy feed, corn meal, fine leaf alfalfa meal, old process linseed oil meal, corn gluten feed, sterilized meat and bone product pulverized, charcoal, salt	Below guaranty in protein. Inferior to guarantee. Alfalfa meal and not alfalfa leaf meal. Only small amount oil meal present.

TABLE III.—POULTRY FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot	Fat	Fiber
2474-20	Simco Scratch Feed	Simmons Milling Co.	10.75	4.32	3.17
		Cincinnati, Ohio.	**10.00**	**2.50**	**5.00**
2474-20	Same	Same	10.50	3.82	3.05
			10.00	**2.50**	**5.00**
2473-20	Simco Chick Feed	Same	11.75	3.68	3.74
			10.00	**2.50**	**5.00**
1492-20	Atlas Scratch Feed	Southern Seed Co.	10.63	4.42	2.58
		Louisville, Ky.	**10.00**	**3.00**	**6.00**
1492-20	Atlas Scratch Feed	Same	11.38	3.54	2.40
			10.00	**3.00**	**6.00**
2722-20	Kyco Scratch Feed	The Sugarine Co.	11.50	3.62	4.23
		Owensboro, Ky.	**10.00**	**2.50**	**5.00**
2145-19	Hoosier Poultry Feed	Tell City Flouring Mills	11.50	3.27	2.50
		Tell City, Ind.	**10.00**	**3.50**	**5.00**
185-20	Vamico Hen Feed	Valley Milling Co.	10.25	3.54	3.26
		St. Louis, Mo.	**8.00**	**2.00**	**12.00**
408-19	Yopp's Hen Feed	M. J. Yopp Seed Co.	10.13	3.15	2.80
		Paducah, Ky.	**10.22**	**3.84**	**4.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2474-20	Danville Ice & Coal Co.. Danville.	Corn, barley, oats, wheat, kaffir, buckwheat, sunflower seed....	
2474-20	Brown, Bell & Cowgill .. Lexington.	Same	
2473-20	Danville Ice & Coal Co.. Danville.	Corn, oat groats, millet, wheat, kaffir	
1492-20	A. D. Ashcraft .... Irvington.	Wheat, corn, oats, barley, kaffir corn, milo maize, sunflower seed	No barley or sunflower seed present.
1492-20	Tunis & Co. .... Lexington.	Same	Same.
2722-20	The Mahan Co. .... Hazard.	Corn, wild buckwheat, kaffir, oats, barley, wheat, sunflower seed......	Wheat derived from wheat screenings.
2145-19	A. D. Ashcraft .... Irvington.	Cracked corn, whole wheat.....	Contains corn cockle.
185-20	J. W. Davis .... Elkton.	Cracked corn, kaffir corn, milo, oats, wheat screenings 20%...	
408-19	Mfrs. Warehouse.	Wheat, corn, kaffir corn, rye, sunflower seed, unground wheat screenings 10%	Oats and watermelon seed present.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
	Miscellaneous Mixed Feeds				
311-19	Acme Horse and Mule Feed	Acme-Evans Co.	9.88	3.74	3.33
		Indianapolis, Ind.	10.00	4.00	5.00
2646-20	Acme C. O. & B. Chop	Same	9.50	3.45	10.83
			8.00	4.00	7.00
318-19	Acme Dairy Feed	Same	25.88	5.24	10.99
			25.00	5.00	9.00
318-19	Same	Same	24.25	5.78	9.63
			25.00	5.00	9.00
1431-19	Big X Hog Feed	Acme-Jones Co.	17.75	4.40	7.43
		Louisville, Ky.	14.00	4.80	8.50
1431-19	Same	Same	15.00	6.02	9.00
			12.00	4.50	8.00
2711-20	Heavy Work Horse and Mule Sweet Feed	The Acme Mills	9.06	3.54	7.25
		Hopkinsville, Ky.	9.50	3.25	8.75
2711-20	Same	Same	10.00	3.40	6.74
			9.50	3.25	8.75
80-19	"Supreme" Hog Feed	Same	17.38	5.91	6.03
			17.00	5.50	6.00
80-20	Same	Same	15.88	5.90	5.42
			17.00	5.50	6.00
80-20	Same	Same	16.06	4.08	4.75
			17.00	5.50	6.00
2457-20	Alfosweet Horse and Mule Feed	Alfocorn Milling Co.	9.75	1.56	12.00
		St. Louis, Mo.	9.00	2.00	13 50
477-21	Alfocorn Special Horse and Mule Feed	Same	9.50	4.18	6.60
			9.00	2.00	13.50
2833-20	Empire 20% Dairy Feed	American Milling Co.	24.63	5.16	9.46
		Peoria, Ill.	20.00	4.50	8.00
2105-18	Arcady (R. K. D.) Hog Meal and Peat	Arcady Farms Milling Co.	18.13	4.09	8.21
		Chicago, Ill.	18.00	5.00	10.00
28-20	Diamond "A" Horse Feed	J. S. Ashbrook Co.	10.13	3.79	11.31
		Mattoon, Ill.	9.00	2.00	12.00
2351-19	Jersey Cream Dairy Feed	Ashland Milling Co.	13.13	2.81	12.11
		Ashland, Ky.	13.00	3.50	12.00
521-19	Glaskoat Horse Feed	J. J. Badenoch Co.	11.75	3.28	9.53
		Chicago, Ill.	10.00	2.00	16.00
2324-19	Ballards Corn and Oat Chop	Ballard & Ballard Co.	10.50	6.22	6.04
		Louisville, Ky.	9.60	3.80	7.50
2655-20	Ballards Corn, Oats, Barley Chop	Same	12.00	3.96	6.40
			10.00	4.00	7.50

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
311-19	Sharp & McCreary Corbin.	Cracked corn, rolled oats, salt	
2646-20	Same	Corn, oats and barley	Below guaranty in fat and above guaranty in fiber.
318-19	Same	Linseed oil meal, corn gluten feed, wheat bran, cotton seed meal, dried brewers' grains, salt	Same.
318-19	Same	Same	Below guaranty in protein and above in fiber. No linseed oil meal found.
1431-19	Smith Chadwell Co. Middlesboro.	Wheat middlings, hominy feed, ground oats, linseed oil meal, gluten feed, salt	Wheat bran present. No corn gluten feed found.
1431-19	Same	Corn feed meal, cotton seed meal, wheat middlings, palmo meal	Above guaranty in fiber.
2711-20	J. G. Gresham Hopkinsville.	Corn, oats, alfalfa meal, molasses, salt ½%	
2711-20	Forbs Mfg. Co. Hopkinsville.	Same	
80-19	Mfrs. Warehouse	Digester tankage, corn meal, wheat shorts	Contains rice hulls.
80-20	Same	Digester tankage, corn meal, wheat shorts, rice bran	Below guaranty in protein.
80-20	T. M. Wooldridge Hopkinsville.	Same	Below guaranty in protein and fat.
2457-20	W. T. Sistrunk & Co. Lexington.	Alfalfa meal, crushed whole oats, crushed whole corn, molasses, salt	
477-21	Dixie Wholesale Grocery Co., Barboursville.	Alfalfa meal, whole oats (crushed), whole corn (crushed), molasses, salt ½%	Contains wild oats and pin oats.
2833-20	J. E. M. Milling Co. Frankfort.	Wheat bran, linseed meal, prime cotton seed meal, prime peanut meal, cocoanut meal, corn gluten feed, corn distillers' dried grains, corn feed meal, alfalfa meal, molasses, salt, calcium carbonate ½%	Above guaranty in fiber.
2105-18	C. L. Jewell Horse Cave.	Wheat middlings, linseed oil meal, digester tankage, corn feed meal, corn germ meal, cleaned, ground and bolted grain screenings 17%, salt 1%	Below guaranty in fat.
28-20	N. I. Toombs Madisonville.	Corn, oats, alfalfa, molasses	
2351-19	Mfrs. Warehouse	Alfalfa meal, molasses, wheat bran, wheat middlings, salt	Below guaranty in fat.
521-19	Williams Feed Co. Pikeville.	Corn, oats, barley, alfalfa meal, molasses	
2324-19	Qualls & Dennes Olive Hill.	Crushed corn, crushed oats	
2655-20	R. S. Van Arsdall & Bro. Harrodsburg.	Ground corn, oats, barley	

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2657-20	Ballard's Dairy Feed	Ballard & Ballard Co. Louisville, Ky.	22.56	5.98	9.33
			20.00	**4.50**	**10.00**
2657-20	Same	Same	20.50	6.45	8.98
			20.00	**4.50**	**10.00**
2799-20	Ballard's Dairy Feed (24% Protein)	Same	25.00	5.65	10.17
			24.00	**5.00**	**12.00**
2799-20	Same	Same	24.63	6.58	9.62
			24.00	**5.00**	**12.00**
2635-20	“All Round Feed”	Same	18.25	5.91	7.67
			16.00	**4.00**	**9.00**
573-20	Peerless Cow Feed	Blue Grass Commission Co. Lexington, Ky.	20.25	4.47	7.90
			19.50	**5.45**	**7.60**
573-20	Same	Same	19.50	4.90	8.03
			19.50	**5.45**	**7.60**
573-20	Same	Same	21.75	5.40	6.80
			19.50	**5.45**	**7.60**
1855-19	Butler's Premium Hog Feed	Edw. J. Butler & Co. Chicago, Ill.	23.13	5.57	10.70
			23.00	**4.00**	**12.00**
1855-19	Same	Same	21.88	4.74	10.79
			23.00	**4.00**	**12.00**
2674-20	Peerless Hog Feed	Cate Milling Co. Hopkinsville, Ky.	14.13	5.06	7.00
			23.00	**5.50**	**4.67**
111-20	“No Better” Horse and Mule Feed	The Cincinnati Grain & Hay Co., Cincinnati, Ohio.	11.00	4.34	8.85
			12.00	**4.00**	**10.00**
2683-20	Barley and Oat Feed	The Cincinnati Grain & Hay Covington, Ky.	11.88	3.29	9.35
			11.00	**3.50**	**12.00**
2448-18	“No Better” Dry Dairy Ration	The Cincinnati Grain & Hay Co., Covington, Ky.	20.50	6.79	12.76
			21.24	**6.60**	**12.30**
112-20	“No Better” Sweet Dairy Feed	Same	17.50	4.03	11.50
			19.00	**5.50**	**12.50**
112-20	Same	Same	18.38	4.05	11.06
			19.00	**5.50**	**12.50**
112-20	Same	Same	16.88	5.03	12.17
			19.00	**5.50**	**12.50**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2657-20	Gray & Trent Irvington.	Wheat bran, wheat middlings, hominy feed, corn feed meal, linseed meal, corn gluten feed, cotton seed meal, barley, ground grain screenings 2%, salt 1%	
2657-20	J. E. Howerton Beattyville.	Same	
2799-20	La Grange Feed & Grain Co., Lagrange.	Wheat bran, wheat middlings, cotton seed meal, maltose process gluten feed from corn and barley, germ oil meal, dried brewers' grains, old process linseed meal, ground grain screenings 5%, salt 1%	
2799-20	O. A. Lutes & Co. Shepherdsville.	Same	
2635-20	Bryant Feed Co. Corbin.	Wheat middlings, wheat bran, old process linseed meal, hominy feed, barley, corn feed meal, corn bran, ground grain screenings 2%, salt ½%	
573-20	M. S. Crain Jackson.	Cotton seed meal, shipstuff, corn, oats, barley	Below guaranty in fat.
573-20	Thos. Jameson & Son Beattyville.	Same	Below guaranty in fat and above in fiber. Shipstuff is wheat bran.
573-20	Estill Ice Co. Irvine.	Same	Below guaranty in fat.
1855-19	Allendale Farms Shelbyville.	Wheat middlings, barley flour, flour middlings, red dog flour, alfalfa meal, linseed oil meal, digester tankage	
1855-19	Edw. M. Riedling Louisville.	Same	Below guaranty in protein.
2674-20	Barkley & Crutchfield Pembroke.	Reground corn hearts, shipstuff, digester tankage	Sample contains corn bran, corn meal, and very little if any corn hearts. Inferior to guarantee. Below guaranty in protein and high in fiber.
111-20	Lexington Grain & Feed Co., Lexington.	Corn, oats, alfalfa meal, brewers' dried grains, molasses, salt ½%	Wheat bran present but not guaranteed. No brewers' dried grains present. Below guaranty in protein.
2683-20	Louis Trenkamp Covington.	Ground barley, ground oats	Contains corn product.
2448-18	Hill Congleton & Son Beattyville.	Distillers' dried grains, brewers' dried grains, malt sprouts, cotton seed meal, linseed meal, hominy feed meal, wheat bran, wheat middlings, salt ½%	No malt sprouts or linseed meal present as guaranteed. Below guaranty in protein.
112-20	H. B. Ringo Mt. Sterling.	Malt sprouts, brewers' dried grains, distillers' dried grains, cotton seed meal, hominy meal, wheat bran, molasses, salt ½%	No malt sprouts present as guaranteed. Below guaranty in protein and fat.
112-20	R. M. Harrison & Son Maysville.	Same	Below guaranty in both protein and fat.
112-20	New Crescent Lumber Co. Danville.	Same	Below guaranty in protein. Inferior to guaranty.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2315-19	"No Better" Hog Ration	The Cincinnati Grain & Hay Co., Cincinnati, Ohio.	18.25 **19.10**	9.14 **10.91**	12.24 **16.34**
2315-20	Same	Same	21.13 **19.10**	4.48 **10.91**	10.03 **16.34**
2315-20	Same	Same	19.00 **19.10**	9.48 **10.91**	11.30 **16.34**
229-20	Corno Sweet Feed	The Corno Mills Co. .... St. Louis, Mo.	11.13 **10.00**	2.65 **2.50**	9.69 **15.00**
239-20	Shamrock Sweet Feed	Same	11.38 **10.00**	2.17 **2.50**	12.63 **15.00**
2952-21	Shamrock Premium Feed	Same	10.81 **9.50**	2.99 **3.25**	7.61 **7.50**
1771-19	Corno Hog Feed	Same	16.75 **16.00**	4.95 **5.00**	6.73 **10.00**
1771-19	Same	Same	16.88 **16.00**	6.90 **5.00**	8.70 **10.00**
1771-19	Same	Same	17.75 **16.00**	7.05 **5.00**	8.75 **10.00**
2298-19	Pawnee Hog Feed	Same	15.25 **14.00**	7.05 **5.00**	11.15 **12.00**
357-20	Diamond Horse and Mule Feed...	Diamond Mills .... Evansville, Ind.	10.75 **9.00**	3.23 **2.50**	14.78 **17.00**
357-20	Same	Same	9.88 **9.00**	3.63 **2.00**	7.90 **17.00**
1766 20	Red Crown Horse and Mule Feed	Same	10.25 **9.00**	2.38 **2.00**	10.87 **15.00**
9-20	Diamond Cow Feed	Same	23.00 **24.00**	4.89 **5.00**	12.75 **14.00**
9-21	Same	Same	24.69 **24.00**	5.10 **5.00**	9.55 **14.00**
2521-18	Polo Horse Feed	Dixie Mills Co. .... St. Louis, Ill.	9.50 **9.00**	2.07 **1.50**	15.18 **12.00**
89-20	Dixie Horse and Mule Feed	Same	10.50 **10.00**	2.23 **2.50**	11.60 **12.00**
589-19	Tuxedo Chop	The Early & Daniel Co. ..... Cincinnati, Ohio.	11.63 **10.00**	3.41 **3.00**	10.60 **12.00**
262-20	Same	The Early & Daniel Co. ..... Covington, Ky.	11.75 **10.00**	4.11 **3.00**	10.29 **12.00**
589-20	Same	The Early & Daniel Co. ..... Cincinnati, Ohio.	11.25 **10.00**	4.35 **3.00**	10.65 **12.00**
589-20	Same	Same	12.00 **10.00**	3.95 **3.00**	8.90 **12.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2315-19	Adams & Langford Harrodsburg.	Tankage, linseed oil meal, palmo middlings, whole ground barley feed, gluten feed, wheat middlings, fine ground alfalfa, corn meal	Below guaranty in both protein and fat.
2315-20	R. M. Harrison & Son Maysville.	Same	Wheat bran, corn gluten feed and cotton seed hulls present but not guaranteed. Below guaranty in fat.
2315-20	Dorsey Bros. & Fisher Carlisle.	Same	Rice bran, rice hulls and cocoanut meal present. Below guaranty in fat.
229-20	H. T. Hackney Co. Middlesboro.	Whole oats, crushed, ground choice alfalfa, cracked corn, molasses	
239-20	Woodson Coal & Feed Co. Middlesboro.	Same	
2952-21	Harlan Grocery & Grain Co., Harlan.	Whole oats crushed, alfalfa meal, wheat bran, molasses, cracked corn	Contains pin and wild oats.
1771-19	The H. T. Hackney Co. Middlesboro.	Fine ground feeding oatmeal, gluten feed, corn feed meal, ground wheat screenings 25%, cotton seed meal	
1771-19	J. E. Stone & Co. Lexington.	Same	
1771-19	Lancaster Smith Seed Co. Owensboro.	Same	
2298-19	Same	Wheat shorts (middlings), cotton seed meal, ground wheat screenings 15%, alfalfa meal, wheat bran, hominy feed, rice bran	Small amount of oats present. No cotton seed meal found.
357-20	Dunbar & Henry Princeton.	Corn, oats, alfalfa meal, molasses	
357-20	Elkins & Kimmel Greenville.	Same	
1766-20	Mayes-Dean Co. Marion.	Same	
9-20	Elkins & Kimmel Greenville.	Cotton seed meal, wheat middlings, wheat bran, alfalfa meal, molasses, linseed oil meal, corn feed meal, hominy feed, salt ½%	Below guaranty in protein.
9-21	Same	Same	
2521-18	S. C. Jennings Madisonville	Ground corn, oats, ground alfalfa, molasses	Composed mainly of alfalfa meal. Above guaranty in fiber.
89-20	Raymond Coal Co. Cynthiana	Corn, oats, ground alfalfa, sugar cane molasses	
589-19	Stuart & O'Brien Paris	Corn, oats, Brewers' grains, molasses	Alfalfa meal and wheat bran found in addition to guaranteed ingredients.
262-20	Owen & Ducker Butler	Corn, oats, alfalfa meal, wheat bran, Brewers' grains, molasses	Cotton seed meal present.
589-20	Kentucky Wholesale Co. Pikeville	Same	
589-20	J. C. Day & Co. Whitesburg	Same	

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
590-19	Forage Horse and Mule Feed	The Early & Daniel Co.	11.88	2.34	14.69
		Cincinnati, Ohio.	10.00	2.00	15.00
2175-19	Ground Barley and Ground Oats	Same	11.63	4.20	9.08
			11.00	3.00	8.00
1780-19	Ground Barley and Oats	Same	12.75	3.13	6.31
			11.00	3.00	9.00
590-20	Forage Horse and Mule Feed	Same	11.38	2.65	13.33
			10.00	2.00	15.00
568-19	Ce-re-a-lia Sweets for the Dairy	Same	24.38	4.22	7.22
			19.00	4.50	10.00
568-20	Same	Same	22.63	4.53	9.53
			20.00	4.50	10.00
568-20	Same	Same	22.00	5.24	10.10
			20.00	4.50	10.00
568-20	Same	Same	21.13	4.95	7.35
			20.00	4.50	10.00
263-20	Same	The Early & Daniel Co.	23.25	6.02	10.02
		Covington, Ky.	20.00	4.50	10.00
263-20	Same	Same	22.56	4.75	8.44
			20.00	4.50	10.00
263-21	Same	Same	19.75	5.15	8.82
			20.00	4.50	10.00
2309-19	Tuxedo Hog Ration	The Early & Daniel Co.	18.50	4.21	6.65
		Cincinnati, Ohio.	14.50	3.50	7.00
2309-19	Same	Same	17.75	3.90	6.46
			14.50	3.50	7.00
2309-19	Same	Same	17.50	3.84	6.25
			14.50	4.50	7.00
2309-19	Same	Same	18.13	3.77	7.09
			14.50	3.50	7.00
2309-19	Same	Same	18.25	3.61	6.70
			14.50	3.50	7.00
2309-19	Same	Same	17.38	3.68	6.15
			14.50	3.50	7.00
2309-20	Same	Same	18.13	4.63	6.19
			14.50	3.50	7.00
2309-20	Same	Same	18.13	4.43	7.12
			14.50	3.50	7.00
826-20	Arrow Dairy Feed	Edinger & Co.	19.38	4.02	15.10
		Louisville, Ky.	19.00	4.50	11.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
590-19	Taulbee & Co. Hazard.	Corn, oats, alfalfa meal, molasses	
2175-19	Corbin Grocery & Feed Store, Corbin.	Ground barley, ground oats.	Above guaranty in fiber.
1780-19	I. F. Tabb Mt. Sterling.	Whole ground barley, whole ground oats	
590-20	Taulbee & Co. Hazard.	Corn, oats, alfalfa meal, molasses,	
568-19	Same	Cotton seed meal, brewers' grains, corn meal, malt sprouts, wheat bran, wheat middlings, corn gluten feed, molasses	No malt sprouts present.
568-20	Stuart & O'Brien Paris.	Same	
568-20	Adams & Langford Harrodsburg.	Brewers' grains, cotton seed meal, corn meal, malt sprouts, wheat bran, wheat middlings, corn gluten feed, molasses	
568-20	Taulbee & Co. Hazard.	Brewers' grains, cotton seed meal, corn meal, wheat bran, wheat middlings, corn gluten feed, molasses, oil meal..	
263-20	Owen & Ducker Butler.	Same	No linseed oil meal present.
263-20	Frank H. Steenken Covington.	Same	Same.
263-21	John Wingermuhl Latonia.	Same	
2309-19	Adams & Langford Harrodsburg.	Digester tankage, ground barley, ground oats, corn meal, wheat middlings, old process linseed oil meal, gluten feed, alfalfa meal, cane molasses	Wheat bran present.
2309-19	Kentucky Wholesale Co.. Pikeville.	Same	
2309-19	F. B. Henry & Sons Carlisle.	Same	Below guaranty in fat.
2309-19	J. H. Johnson Jackson.	Same	
2309-19	Owen & Ducker Butler.	Same	
2309-19	C. T. Ashley & Co. Nicholasville.	Same	
2309-20	Augusta Milling Co. Augusta.	Same	
2309-20	E. L. Goodridge Walton.	Same	
826-20	Shelby County Feed & Grain Co., Shelbyville.	Brewers' grains, distillers' grains, corn meal, alfalfa, cotton seed meal, molasses, wheat middlings, wheat bran.	Below guaranty in fat and above in fiber. The distillers' dried grains are from kaffir corn, kaffir corn, wheat screenings, weed seeds and oat by-product present. Above guaranty in fiber.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
142-19	York Dairy Feed	The Eikenberry-Fitzgerald Co. Cincinnati, Ohio.	14.50 16.00	4.20 3.00	9.13 14.00
148-19	Sunshine Dairy Feed	Same	13.13 16.00	2.53 3.00	7.70 12.00
136-19	Blue Boar Hog Feed	Same	17.13 17.00	4.97 5.50	7.43 13.00
136-19	Same	Same	16.88 17.00	3.53 5.50	7.13 13.00
1177-20	"Elmendorf Tango" Horse Feed.	Elmendorf Coal & Feed Co. .. Lexington, Ky.	12.13 11.63	3.62 3.51	17.47 11.20
99-19	Reliable Molasses Feed	Excello Feed Milling Co. ... St. Joseph, Mo.	9.25 9.00	0.90 1.00	21.20 25.00
93-19	Reliable Horse and Mule Feed...	Same	11.00 10.00	2.49 3.00	13.23 15.00
92-20	Excello Special Horse Feed	Same	12.25 10.00	3.24 3.00	11.93 15.00
2077-20	Cracker Jack Horse and Mule Feed	Ferncliff Feed & Grain Co. .. Louisville, Ky.	11.13 10.00	3.00 3.00	10.60 12.00
2083-20	P. D. Q. Horse and Mule Feed....	Same	12.63 9.00	2.38 2.50	13.16 13.00
2080-20	Cracker Jack Dairy Ration......	Same	24.38 21.00	4.38 3.50	14.96 14.00
2079-20	Cracker Jack Dairy Feed	Same	17.25 18.00	3.70 3.00	12.12 12.00
2084-20	P. D. Q. Dairy Feed	Same	18.88 15.00	3.21 3.00	13 13 15.00
2865-20	"Logan" Dairy Feed	Same	13.75 12.00	1.93 1.50	16.70 18.50
357-19	Diamond Horse and Mule Feed..	Fisher Bros. .... Evansville, Ind.	11.13 9.00	3.52 2.50	11.73 17.00
358-20	Red Crown Dairy Feed	Same	21.38 18.00	4.83 4.50	15.07 17.00
2488-20	Wheato Dairy Feed.............	Same	19.25 15.00	4.07 2.00	18.08 15.00
2595-20	Evansville Dairy Feed	Fischer Bros. .... Evansville, Ind.	18.75 16.00	4.39 3.50	11.93 13.00
2061-19	Greenfield Dairy Feed	Same	9.63 10.00	1.21 0.50	18.01 25.00
8-19	Diamond Hog and Pig Meal......	Same	23.75 20.00	5.50 5.50	12.10 12.00
8-19	Same	Same	22.50 20.00	5.18 5.50	13.15 12.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
142-19	Glass Milling Co. Wilmore.	Ground oats, wheat mixed feed, malt sprouts, brewers' grains, corn meal, cotton seed meal, cotton seed hulls 2%, barley middlings, gluten meal, corn bran, salt	Below guaranty in protein.
148-19	W. P. Farley & Co. Maysville.	Hominy meal, corn meal, wheat mixed feed, alfalfa meal, brewers' grains, gluten meal, barley middlings, corn bran, prime cotton seed meal, molasses, salt	Same.
136-19	Glass Milling Co. Wilmore.	Digester tankage, hominy meal, gluten feed, corn meal, wheat mixed feed	Below guaranty in fat.
136-19	Same	Same	Below guaranty in fat. Oat and barley hulls present.
1177-20	J. H. Hanley & Bro. Lexington.	Rolled oats, cracked corn, alfalfa meal, cane molasses, wheat bran	Above guaranty in fiber.
99-19	Bush & Pritchard Ashland.	Alfalfa meal, molasses	
93-19	Lovett Fruit & Produce Co., Harlan.	Alfalfa meal, corn chop, oats, molasses, salt, 1%.	Below guaranty in fat.
92-20	Same	Alfalfa meal, corn chop, oats, mocane molasses, linseed oil meal, salt 1%	
2077-20	Anderson Feed & Seed Co., Lawrenceburg.	Whole cracked corn, whole rolled oats, alfalfa meal, cane molasses, wheat bran, salt 1%	
2083-20	G. B. Moores Waco.	Cracked corn, rolled oats, alfalfa meal, wheat bran, cane molasses, salt 1%	
2080-20	J. H. Johnson Jackson.	Corn gluten feed, old process linseed oil meal, cotton seed meal, alfalfa meal, wheat bran, salt 1%	Above guaranty in fiber.
2079-20	J. D. Williams & Son Beaver Dam.	Corn gluten feed, old process linseed oil meal, cotton seed meal, alfalfa meal, cane molasses, wheat bran, salt 1%	Below guaranty in protein.
2084-20	Anderson Feed & Seed Co., Lawrenceburg.	Corn gluten feed, wheat bran, alfalfa meal, cotton seed meal, cane molasses, salt 1%	
2865-20	Cameron's Mill Carrollton.	Wheat bran, cotton seed meal, alfalfa meal, cane molasses, salt 1%	
357-19	J. J. Shaver Mayfield.	Corn, oats, alfalfa meal, molasses	
358-20	Earlington Co-operative Store, Earlington.	Alfalfa meal, molasses, corn feed meal, wheat bran, wheat middlings, hominy feed, linseed oil meal, cotton seed meal, processed wheat salt ½%	No linseed oil meal found.
2488-20	Henderson Feed & Commission, Henderson.	Processed wheat, wheat bran, molasses	Above guaranty in fiber.
2595-20	J. J. Shaver Mayfield.	Processed wheat, wheat bran, wheat middlings, cotton seed meal, salt ½%	Unground wheat screenings present.
2061-19	J. O. Speed Madisonville.	Alfalfa meal, molasses	In addition to guaranteed materials this feed contains oats and oat hulls.
8-19	K. C. Mason Adairville.	Digester tankage, wheat middlings, linseed oil meal, cotton seed meal, corn feed meal, peanut meal, hominy feed, salt ½%	
8-19	Wilson & Son Russellville.	Same	Above guaranty in fiber.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2269-19	Barley and Wheat Screenings	Frost & Duvall	12.25	3.05	15.00
		Lexington, Ky.	11.00	2.50	8.50
1244-20	Blue Grass Horse Feed	Henry Fruechtenicht	12.25	2.95	11.75
		Louisville, Ky.	10.00	2.50	16.00
1245-19	Blue Grass Dairy Feed	Same	21.13	3.77	17.79
			18.00	3.00	12.00
1245-19	Same	Same	23.13	4.67	18.20
			18.00	3.00	12 00
1245-20	Same	Same	21.00	3.75	17.34
			18.00	3.00	12.00
1245-20	Same	Same	21.13	5.06	17.90
			18.00	3.00	12.00
402-19	Ideal Pig Meal	Gallatin Milling Co.	9.00	4.77	5.97
		Gallatin, Tenn.	10.18	5.50	6.25
3093-21	Big Gee Horse and Mule Feed	The Edw. F. Goeke Co.	10.50	3.21	9.25
		Evansville, Ind.	10.00	2.50	12.00
2521-20	Crescent Dairy Feed Ration	Same	19.13	5.17	13.32
			17.00	4.00	16.00
2386-20	Big Gee Hog Feed	Same	19.38	6.27	9.04
			17.50	5.00	8.50
915-19	Big Ben Horse and Mule Feed	Golden Grain Milling Co.	9.75	1.65	13.33
		East St. Louis, Ill.	9.00	2.00	12.00
915-20	Same	Same	10.88	3.11	10.94
			9.00	2.00	12.00
915-20	Same	Same	10.75	3.45	12.71
			9.00	2.00	12.00
919-20	Golden Grain Horse and Mule Feed	Same	11.50	2.24	15.15
			9.00	2.00	14.00
919-20	Same	Same	11.13	2.46	13.55
			9.00	2.00	14.00
919-20	Same	Same	10.25	2.74	12.98
			9.00	2.00	14.00
2373-20	Hood's Special Horse Feed	Same	10.75	3.58	7.43
			9.00	2.00	12.00
924-19	Mascot Horse Feed	Same	10.75	2.33	16.60
			9.00	1.50	18.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2269-19	Payne & Estes, Eubank.	Barley screenings, wheat screenings	Ground oats present. Above guaranty in fiber.
1244-20	Corbin Feed & Grocery Store, Corbin.	Corn, oats, alfalfa, molasses	
1245-19	P. M. Landram & Sons, Corbin.	Corn meal, cotton seed meal, molasses, bran, alfalfa meal	Above guaranty in fiber. Contains no corn product or wheat bran. Contains brewers' grains and linseed oil meal in addition to guaranteed ingredients.
1245-19	The Bryant Feed Co., Corbin.	Same	No corn meal or wheat bran present. Dried brewers' grains present. Above guaranty in fiber.
1245-20	Cole Hughes & Co., Barbourville.	Same	No corn meal or wheat bran present. Dried brewers' grains and cotton seed hulls found. Feed is dry and moldy and in bad condition. Above guaranty in fiber.
1245-20	Thompson Grocery Co., Pineville.	Same	No corn meal or wheat bran present. Dried brewers' grains present. Feed is dry and moldy and in bad feeding condition. Above guaranty in fiber.
402-19	Franklin Elevator & Warehouse Co., Fklin.	Corn, corn bran	Below guaranty in protein and fat.
3093-21	S. C. Jennings, Madisonville.	Oats, corn, ground alfalfa, molasses	
2521-20	Rea & Rice, Earlington.	Cotton seed meal, linseed meal, brewers' dried grains, alfalfa meal, molasses, ground flaxseed screenings 20%, toasted wheat feed, wheat mixed feed	Corn feed meal found but not guaranteed.
2386-20	Henderson Feed & Commission Co., Henderson.	Tankage, hominy feed, oil meal, barley shorts, palmo middlings (wheat shorts and palm oil), wheat middlings, ground flaxseed screenings 10%	Above guaranty in fiber. Flaxseed screenings contain weed seeds.
915-19	Mitchell & Kenney, Danville.	Corn, oats, alfalfa meal, molasses, salt ½%	Above guaranty in fiber.
915-20	Fulton Mill Co., Fulton.	Same	
915-20	Joe Lovett, Williamsburg.	Same	Above guaranty in fiber.
919-20	Louis des Cognets & Co., Lexington.	Same	Same.
919-20	Powell-Hackney Grocery Co., Hazard.	Same	
919-20	Joe Lovett, Williamsburg.	Same	
373-20	Bell Grocery Co., Pineville.	Same	
924-19	Fulton Mill Co., Fulton.	Same	

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
924-19	Mascot Horse Feed	Golden Grain Milling Co.	8.47	2.58	16.44
		East St. Louis, Ill.	9.00	1.50	18.00
917-20	Protection Horse and Mule Feed.	Same	10.75	3.94	8.83
			9.00	2.00	12.00
917-20	Same	Same	12.00	2.78	7.67
			9.00	2.00	12.00
2697-18	Butter Fat Dairy Feed	Same	18.00	3.28	15.08
			18.00	4.00	16.50
2697-18	Same	Same	17.63	3.65	18.63
			18.00	4.00	16.50
2697-18	Same	Same	16.25	3.93	16.53
			18.00	4.00	16.50
953-19	Same	Same	19.88	4.50	19.89
			18.00	4.00	16.50
953-21	Same	Same	21.50	5.05	12.40
			20.00	4.00	12.00
2287-17	"Bronco" Horse and Mule Feed.	Grain Belt Mills Co.	11.25	1.39	13.16
		So. St. Joseph, Mo.	10.00	1.50	15.00
2819-20	Pinto Horse and Mule Feed	Same	7.95	2.33	15.61
			10.00	1.00	18.00
911-19	Dairy Feed	Greenup Milling Co.	16.88	4.13	6.49
		Greenup, Ky.	13.63	2.99	6.50
1262-19	Gwinn's Dairy Feed	The Gwinn Milling Co.	16.75	4.52	8.22
		Columbus, Ohio.	14.00	4.00	11.00
1863-19	College Hog Feed	Hales & Edwards Co.	15.50	4.02	9.60
		Chicago, Ill.	16.00	4.00	10.00
2178-19	Halliday's Standard Dairy Feed.	H. L. Halliday Milling Co.	15.13	3.04	9.70
		Cairo, Ill.	16.50	4.00	15.00
3127-20	Halliday's Extra Choice Mixed Feed	Same	9.13	2.75	10.35
			10.00	2.50	12.00
957-19	Golden Grain	H. P. Hawkins & Sons	10.50	2.90	9.60
		Paducah, Ky.	10.33	3.05	9.78
957-20	Same	Same	10.00	2.00	10.01
			10.33	3.05	9.78
957-21	Same	Same	9.88	3.00	7.70
			10.33	3.05	9.78
82-16	Molasses Crushed Feed	W. E. Hess & Co.	11.25	2.59	19.68
		Louisville, Ky.	12.25	2.75	12.00
1307-20	Golden Dairy Feed	Same	13.50	4.08	16.35
			14.90	3.70	18.65
758-20	Blue Grass Hog Feed	Hopkinsville Milling Co.	12.25	8.48	6.70
		Hopkinsville, Ky.	11.00	9.55	8.85

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
924-19	Wilson & Newman Russellville.	Corn, oats, alfalfa meal, molasses salt ½%	Below guaranty in protein.
917-20	E. L. Martin & Co. Lexington.	Same	
917-20	Bell Grocery Co. Pineville.	Same	
2697-18	Mitchell & Kenney Danville.	Cotton seed meal, corn gluten feed, wheat bran, wheat middlings, alfalfa meal, molasses, copra meal, salt ½%	Below guaranty in fat.
2697-18	New Crescent Lumber Co. Danville.	Same	Above guaranty in fiber.
2697-18	Kentucky Feed & Grain Co., Louisville.	Same	Below guaranty in protein.
953-19	Fulton Mill Co. Fulton.	Cotton seed meal, corn oil cake meal, copra meal, linseed oil meal, alfalfa meal, molasses, salt ½%	Above guaranty in fiber.
953-21	Pineville Grocery Co. Pineville.	Dried beet pulp, cotton seed meal, corn oil cake meal, old process linseed oil meal, copra meal, fine ground alfalfa meal, molasses, salt ½%	
2287-17	Big Sandy Grocery Co. Catlettsburg.	Corn, oats, alfalfa meal, molasses, salt 1%	
2819-20	Pineville Produce Co. Pineville.	Corn, oats, alfalfa meal, molasses. salt ½%	Below guaranty in protein. Inferior to guarantee.
911-19	John Jeems Louisa.	Wheat bran, middlings, corn grits, corn bran	No corn product present.
1262-19	H. B. Ringo Mt. Sterling.	Wheat bran, wheat middlings, ground wheat screenings 10%	
1863-19	Harrodsburg Ice & Produce Co., Harrodsburg.	Digester tankage, flour middlings, ground oats, ground barley, corn feed meal, wheat bran, alfalfa meal, lime ½%, salt ½%	Below guaranty in protein. Contains wild buckwheat and pigeon grass.
2178-19	Herbert Hawkins Paducah.	Cotton seed meal, corn meal, alfalfa meal, bran, molasses	Below guaranty in protein and fat. Contains unground wheat screenings. Inferior to guarantee.
3127-20	Same	Cracked corn, crimped oats, alfalfa, molasses	Below guaranty in protein. Pin oats present.
957-19	J. R. Brandon Benton.	Corn, alfalfa meal, molasses	
957-20	McKeel & Thurmond Murray.	Same	Below guarantee in fat and high in fiber.
957-21	McKeel & Co. Murray.	Same	Below guaranty in protein.
82-16	Mfrs. Warehouse	Corn, oats, bran, alfalfa, molasses	Below guaranty in protein and above in fiber. Cotton seed hulls present but not guaranteed. No wheat bran present.
1307-20	Same	Alfalfa meal, corn feed meal, mixed wheat feed	Below guaranty in protein. Whole oats present.
758-20	Rogers & Barnes Hopkinsville.	Corn	Corn product consisting largely of corn bran, ground. Below guaranty in fat.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
758-20	Blue Grass Hog Feed	Hopkinsville Milling Co.	12.13	8.74	5.87
		Hopkinsville, Ky.	11.00	9.55	8.85
984-19	Dan Patch Special Horse Feed	International Sugar Feed No.	11.00	3.59	11.28
		Two Co., Minneapolis, Minn.	9.00	2.25	12.50
984-20	Same	Same	10.63	3.17	13.71
			9.00	2.25	12.50
984-20	Same	Same	11.13	3.38	10.28
			7.00	2.25	12.50
985-19	International Arrow Horse Feed	Same	11.63	2.19	16.39
			9.00	1.75	15.00
2476-18	International Milk Made Dairy Feed	Same	24.75	8.38	8.45
			24.00	5.00	15.00
997-19	Same	Same	26.13	7.36	9.99
			24.00	5.00	15.00
997-19	Same	Same	25.63	7.43	9.83
			24.00	5.00	15.00
2476-19	Same	Same	23.75	8.18	10.00
			24.00	5.00	15.00
1004-19	"Makmeat" Hog Feed	Same	17.13	10.86	9.40
			15.00	5.00	12.50
1004-19	Same	Same	14.50	7.26	10.28
			15.00	5.00	12.50
1004-19	Same	Same	16.00	7.52	8.43
			15.00	5.00	12.50
1004-19	Same	Same	15.50	7.07	8.30
			15.00	5.00	12.50
2682-18	Corn Gluten Feed and Barley Malt	Mead Johnson & Co.	45.00	8.99	6.71
		Evansville, Ind.	45.00	10.00	7.00
2682-18	Same	Same	41.13	7.64	7.21
			45.00	10.00	7.00
1946-19	Just Horse Feed	Just Mills	10.63	3.61	11.94
		Nashville, Tenn.	10.00	2.00	12.00
1706-19	Just Grainola Feed	Same	11.25	4.07	8.07
			9.60	3.30	8.20
1381-19	Just Dairy Feed	Same	27.00	5.62	13.40
			24.00	4.10	12.00
1381-19	Same	Same	26.00	6.59	11.45
			24.00	4.10	12.00
1265-19	Lotus Dairy Feed	Keister Milling Co.	15.50	4.90	6.85
		Huntington, W. Va.	14.00	4.00	7.00
1265-20	Same	Same	16.00	4.72	7.51
			14.00	4.00	7.50

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
758-20	J. G. Gresham Hopkinsville.	Corn, corn products, consisting largely of corn bran, ground.	Below guaranty in fat.
984-19	David C. Frost & Duvall. Lexington.	Cracked corn, alfalfa meal, oats, molasses, salt	
984-20	M. D. Royse Winchester.	Same	Above guaranty in fiber.
984-20	J. V. Morrow Adairville.	Same	Contains pin oats and weed seeds.
985-19	W. W. Broaddus & Co. Richmond.	Same	Above guaranty in fiber.
2476-18	Goff & Bush Winchester.	Cotton seed meal, wheat bran, rice bran, wheat shorts	
997-19	W. A. Chambers Co. Russellville.	Cotton seed meal, wheat bran, rice bran, wheat shorts, corn gluten feed, linseed oil meal, wheat red dog flour, corn feed meal, salt ½%	Not in accordance with guarantee. Contains whole oats and unground wheat screenings. No corn gluten feed or oil meal present.
997-19	Lancaster-Smith Seed Co. Owensboro.	Same	Same.
2476-19	Henderson Feed Store Henderson.	Cotton seed meal, wheat bran, rice bran, wheat shorts	Weed seeds and screenings present.
1004-19	W. A. Chambers Co. Russellville.	Linseed oil meal, digester tankage, ground and bolted grain screenings 50%, wheat bran and shorts, rice bran, corn feed meal, red dog flour, corn gluten feed, salt	
1004-19	M. D. Royse Winchester.	Same	Below guaranty in protein. No red dog flour, corn gluten feed or linseed oil meal found. Oats and kaffir corn found but not guaranteed.
1004-19	David C. Frost & Duvall. Lexington.	Same	No linseed oil meal or corn gluten feed found.
1004-19	W. A. Chambers Co. Russellville.	Same	Same.
2682-18	Henderson Feed & Commission Co., Henderson.	Corn product, barley, malt.	Below guaranty in fat.
2682-18	Same	Same	Below guaranty in protein and fat.
1946-19	Jellico Grocery Co. Middlesboro.	Corn, oats, ground alfalfa, molasses, salt 1%	
1706-19	Same	Same	
1381-19	Same	Cotton seed meal, old process linseed oil meal, gluten feed from corn, hominy feed, ground alfalfa, molasses, salt 1%	Above guaranty in fiber.
1381-19	Same	Same	
1265-19	Lack-Moore Louisa.	Wheat bran, corn bran, wheat middlings, barley meal, ground screenings 2%	No barley meal present.
1265-20	Louisa Flour & Feed Co. Louisa.	Same	No corn bran or barley meal found. Whole oats present.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1265-20	Lotus Dairy Feed	Keister Milling Co.	15.88	5.57	6.95
		Huntington, W. Va.	14.00	4.00	7.50
1265-20	Same	Same	12.94	8.23	9.80
			14.00	4.00	7.50
1265-20	Same	Same	13.00	7.72	9.75
			14.00	4.00	7.50
614-20	Premo Horse and Mule Feed	Kentucky Feed & Grain Co.	10.15	2.47	13.05
		Louisville, Ky.	9.00	1.50	14.00
614-20	Same	Same	8.88	1.61	16.18
			9.00	1.50	14.00
614-20	Same	Same	10.50	2.56	14.66
			9.00	1.50	14.00
613-21	Success Horse and Mule Feed	Same	10.50	4.20	8.35
			9.00	3.00	10.00
2489-20	Premo Dairy Feed	Same	16.17	2.57	13.56
			16.50	3.00	15.00
2489-20	Same	Same	18.63	3.66	20.80
			16.50	3.00	15.00
2489-20	Same	Same	18.75	7.63	12.27
			16.50	3.00	15.00
2876-20	Marshall's 24% Dairy Feed	Same	23.63	6.70	13.60
			24.00	4.50	14.00
2876-20	Same	Same	23.63	5.65	14.95
			24.00	4.50	14.00
2003-19	King's Winner Dairy Feed	King Manufacturing Co.	23.00	4.34	14.98
		North Vernon, Ind.	18.00	4.00	13.00
2003-19	Same	Same	23.50	5.42	12.41
			18.00	4.00	13.00
2706-20	Badger Blue Top Horse Feed	Chas. A. Krause Milling Co.	11.75	3.09	17.28
		Milwaukee, Wis.	10.00	1.00	16.00
2428-20	True Value Horse Feed	Ladish Milling Co.	11.25	3.21	9.40
		Milwaukee, Wis.	9.00	1.50	15.00
2394-20	Record Maker Dairy Feed	Same	27.75	4.32	9.85
			24.00	4.50	13.00
2394-21	Same	Same	24.75	5.65	11.05
			24.00	4.50	12.00
2416-20	True Value Hog Feed	Same	20.00	5.40	9.99
			16.00	4.00	10.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1265-20	Williams Feed Co. ...... Pikeville.	Wheat bran, corn bran wheat middlings, barley meal, ground screenings 2%.	Contains unground wheat screenings.
1265-20	Louisa Flour & Feed Co.	Same	Below guaranty in protein and above in fiber. Adulterated with rice bran, rice grains and rice hulls. Screenings contain weed seeds.
1265-20	Same	Same	Below guaranty in protein and above in fiber. Adulterated with rice hulls and rice bran. Ground oats and wild oats present. No corn bran present.
614-20	Pineville Produce Co. .. Pineville.	Corn, oats, alfalfa meal, salt ½%	
614-20	Engle-Given Coal Co. ... Lexington.	Same	Above guaranty in fiber.
614-20	Henderson Feed Store .. Owensboro.	Same	Same.
613-21	Sparks & Brown .... London.	Same	
2489-20	Engle-Given Coal Co. ... Lexington.	Cotton seed meal, linseed meal, alfalfa meal, wheat bran, cane molasses, salt ½%	
2489-20	Same	Same	Above guaranty in fiber.
2489-20	Cash Grocery Co. ...... Catlettsburg.	Same	Corn feed meal found though not guaranteed. Oil meal guaranteed but not found.
2876-20	P. Sorton .... Covington.	Cotton seed meal, linseed meal, alfalfa meal, wheat bran, corn feed meal, kaffir corn meal, cane molasses, salt ½%	Rice bran, rice hulls and ground oats present but not guaranteed. No linseed oil meal or kaffir corn found.
2876-20	F. P. Spoonamore ..... Stanford.	Cotton seed meal, linseed meal, alfalfa meal, wheat bran, corn feed meal, kaffir corn meal, rice bran, cane molasses, salt ½%	Above guaranty in fiber. No linseed oil meal or rice bran present.
2003-19	Russellville Feed Co. ... Russellville.	Wheat bran, alfalfa meal, cotton seed meal, ground screenings from clover, millet and alfalfa seed 50%, molasses, salt 1%	Above guaranty in fiber. In addition to ingredients this feed contains corn bran, weed seeds and 3.94% sand.
2003-19	Simmons & McCutchen .. Bowling Green.	Same	
2706-20	C. J. Clausen .... Louisville.	Corn, oats, alfalfa meal, molasses, salt	Above guaranty in fiber.
2428-20	Pikeville Grocery Co. ... Pikeville.	Cracked corn, clipped oats, alfalfa, molasses, salt	
2394-20	Same	Cotton seed meal, linseed meal, corn gluten feed, copra meal, ground oats, hominy feed, alfalfa meal, molasses, wheat bran, salt	
2394-21	Perry Feed & Commission Co., Hazard.	Same	
2416-20	Elkhorn Wholesale Grocery Co., Praise.	Corn feed meal, wheat middlings, alfalfa meal, copra meal, tankage, ground oats, salt	

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1501-15	Sterling Celebrated Cow Feed....	Louisville Hay & Grain Co. .	13.13	3.56	17.40
		Louisville, Ky.	15.10	5.16	11.70
3342-21	Wayne Dairy Feed	The McMillen Co.	24.63	4.03	9.05
		Fort Wayne, Ind.	21.00	3.40	12.00
......	Cooked Cow Feed	McKay-Reece Co.	15.50	4.07	13.65
		Nashville, Tenn.	17.62	5.58	10.01
2801-18	Green Tag Corn Feed	Mountain City Mill Co.	12.25	6.74	3.72
		Chattanooga, Tenn.	12.00	5.50	5.50
1804-20	Domino Vimolene Horse Feed....	Nowak Milling Corporation..	10.88	3.54	6.62
		Buffalo, N. Y.	8.00	2.00	9.00
2529-20	Union Dairy Feed	Same	16.00	6.22	11.25
			14.00	3.50	15.00
2774-20	Gold Leaf Chop	The Nutritia Co.	10.00	3.99	3.12
		Cincinnati, Ohio.	10.00	6.00	6.00
3196-21	Manowar Chop	Same	11.63	4.65	7.08
			10.50	3.50	10.00
143-20	‘‘Nutritia’’ Horse Feed	Same	10.38	4.24	8.66
			10.50	3.50	10.00
143-20	Same	Same	13.34	4.12	8.35
			10.50	3.50	10.00
143-20	‘‘Nutritia’’ Horse Feed	The Nutritia Co.	17.88	5.05	9.05
		Cincinnati, Ohio.	10.50	3.50	10.00
143-20	Same	Same	20.63	5.58	9.50
			10.50	3.50	10.00
143-20	Same	Same	11.00	3.84	10.20
			10.50	3.50	10.00
143-20	Same	Same	10.63	3.47	8.18
			10.50	3.50	10.00
144-20	Queen City Horse Feed	Same	12.25	3.54	6.13
			9.00	3.00	12.00
144-20	Same	Same	12.25	3.84	7.76
			9.00	3.00	12.00
147-20	‘‘Nutritia’’ Dairy Feed	Same	15.75	4.80	8.08
			20.00	5.00	10.50
147-20	Same	Same	18.50	5.73	7.34
			20.00	5.00	10.50
147-20	Same	Same	16.25	5.10	6.05
			20.00	5.00	10.50
148-19	Sunshine Dairy Feed	Same	13.39	3.44	9.22
			16.00	3.00	12.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1501-15	Mfrs. Warehouse	Alfalfa meal, bran, shorts, hominy meal, flour, dried brewers' grains, oil meal, cotton seed meal, salt	Below guaranty in protein and fat and above in fiber. No flour present.
3342-21	Ashland Milling Co. Ashland.	Malt Sprouts, brewers' dried grains, cocoanut oil meal, corn gluten feed, wheat bran, wheat middlings, alfalfa meal, cotton seed meal, linseed oil meal, molasses, salt ½%	
....	Harris & Crowder Franklin.	Cotton seed meal, hominy feed, barley sprouts, salt	Below guaranty in protein and fat and above in fiber. No barley sprouts present.
2801-18	Lovett Fruit & Produce Co., Corbin.	Corn heart meal, ground corn bran, corn meal, ground corn screenings 1%	This feed is corn product containing a little wheat product.
1804-20	Thomas Jameson & Son Beattyville.	Crushed oats, crushed corn, corn feed meal, wheat bran, molasses, salt ¾%	No corn feed meal present as claimed.
2529-20	Geo. Keller Newport.	Cotton seed meal, linseed oil meal, (ground flax and wheat screenings) 70%, molasses	Oats present. Adulterated with a large per cent of weed seeds.
2774-20	Pineville Produce Co. Pineville.	Ground corn, ground oats	Below guaranty in fat.
3196-21	Joe Lovett Williamsburg.	Corn, oats, barley grains, cotton seed meal, wheat bran, molasses, salt	No cotton seed meal present. Pin oats and wild oats present.
143-20	Bacon R. Moore Torrent.	Oats, crushed corn, wheat bran, alfalfa meal, cotton seed meal, brewers' grains, molasses, salt	Contains no wheat bran.
143-20	L. J. Webb & Sons Livingston.	Same	
143-20	Bacon R. Moore Torrent.	Oats, crushed corn, wheat bran, alfalfa meal, cotton seed meal, brewers' grains, molasses, salt	Whole barley and whole wheat present.
143-20	Riverside Co. Beattyville.	Same	
143-20	Farmers Commission Co. Lexington.	Same	
143-20	J. H. Johnson Jackson.	Same	
144-20	J. F. Bertram Vanceburg.	Crushed corn, crushed oats, wheat bran, cotton seed meal, alfalfa meal, brewers' grains, molasses, salt	
144-20	C. A. Casteel East Bernstadt.	Same	
147-20	Bedford & Tuttle Winchester.	Brewers' grains, malt sprouts, hominy meal, wheat mixed feed, linseed oil meal, gluten meal, cotton seed meal, corn meal, barley middlings, salt	Ground barley instead of barley middlings. Ground oats and ground buckwheat present. No gluten meal present. Below guaranty in protein and inferior to guarantee.
147-20	Williamstown Mill & Light Co., Williamst'n.	Same	Below guaranty in protein.
147-20	J. S. Wilson & Bro. Paris.	Same	Not barley middlings but barley feed. Below guaranty in protein and inferior to guarantee.
148-19	W. P. Farley & Co. Maysville.	Hominy meal, corn meal, wheat mixed feed, alfalfa meal, brewers' grains, gluten feed, barley middlings, corn bran, prime cotton seed meal, molasses, salt	Below guaranty in protein.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
148-20	Sunshine Dairy Feed	The Nutrita Co.,	16.50	4.23	8.95
		Cincinnati, Ohio.	16.00	3.00	12.00
148-20	Same	Same	18.13	4.63	9.98
			16.00	3.00	12.00
142-20	York Dairy Feed	Same	17.25	5.72	8.07
			16.00	3.50	12.00
142-20	Same	Same	20.00	6.25	9.18
			16.00	3.50	12.00
136-20	Blue Boar Hog Feed	Same	16.50	4.64	4.72
			17.00	5.50	10.00
136-20	Same	Same	17.75	6.48	7.12
			17.00	5.50	10.00
1836-19	Economy Hog Feed	Ohio Valley Seed Co.	17.25	5.51	11.59
		Evansville, Ind.	17.00	4.00	13.00
1616-19	Booster Horse Feed	Omaha Alfalfa Milling Co.	10.25	2.80	13.93
		Omaha, Neb.	9.00	1.50	18.00
1585-19	‘‘O. P. Co.’’ Alfalfa Horse Feed	Owensboro Products Co.	11.38	4.34	8.75
		Owensboro, Ky.	9.00	3.00	12.00
2266-20	‘‘O. P. Co.’’ 16½% Dairy Feed	Same	19.00	4.35	10.06
			16.50	3.50	14.00
2266-20	Same	Same	17.00	3.82	9.68
			16.50	3.50	14.00
1582-19	‘‘O. P. No. One’’ Hog Meal	Same	18.50	3.60	9.15
			18.00	4.00	10.00
2262-20	‘‘Opco’’ Pig Meal	Same	16.75	4.15	6.41
			18.00	5.50	10.00
2262-20	Same	Same	17.00	3.99	7.42
			18.00	5.50	10.00
3237-21	Ivanhoe Horse and Mule Feed	M. C. Peters Mill Co.	10.50	2.86	8.60
		Omaha, Neb.	9.00	3.50	8.00
643-19	Peter's Arab Horse Feed	Same	11.50	3.21	10.40
			10.00	2.00	15.00
645-19	Peter's King Corn Horse and Mule Feed	Same	12.13	2.04	16.13
			10.00	1.50	18.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
148-20	W. P. Farley & Co. Maysville.	Hominy meal, wheat bran, wheat middlings, cotton seed meal, linseed oil meal, alfalfa meal, brewers' grains, molasses, salt	
148-20	Percival & Coffman Walton.	Same	No linseed oil meal found. Weed seeds present. Distiller's grains substituted for brewers' grains.
142-20	J. F. Bertram Vanceburg.	Ground oats, wheat mixed feed, malt sprouts, brewers' grains, cotton seed meal, corn meal, barley middlings, gluten meal, corn bran, linseed oil meal, salt	Small amount of unground oats and weed seeds present.
142-20	Lewis Wholesale Co. Whitesburg.	Same	
136-20	Williamstown Mill & Light Co., Williamst'n.	Digester tankage, hominy meal, gluten meal, corn meal, wheat bran, wheat middlings	Below guaranty in protein and fat. Unground wheat screenings, barley and oat hulls present.
136-20	Science Hill Milling Co. Science Hill.	Same	Ground barley and ground oats present though not guaranteed.
1836-19	American Co - Operative Association, Hartford.	Ground barley, wheat middlings (ground wheat, barley and oat sreenings) 24%, processed wheat and bran, digester tankage, charcoal	No charcoal present.
1616-19	Edw. M. Riedling Louisville.	Corn, oats, alfalfa meal, molasses.	
1585-19	Hurst & Co. Lexington.	Oats, cracked corn, alfalfa, molasses, salt 1%	
2266-20	J. H. Baughman & Co. Stanford.	Molasses, ground and bolted wheat screenings 25%, barley, cotton seed meal, cocoanut meal, corn feed meal, alfalfa meal, calcium carbonate ½%, salt ½%	Oat product; also whole and ground weed seeds present.
2266-20	Edw. M. Riedling Louisville.	Same	Wild buckwheat and wild mustard seeds also crushed oats present in addition to guaranteed ingredients. No barley present.
1582-19	Hurst & Co. Lexington.	Molasses, fine ground alfalfa, corn feed meal, corn germ meal, ground barley, old process linseed meal, meat meal, prime peanut meal, cocoanut meal, calcium carbonte ½%, salt ½%	
2262-20	J. H. Baughman & Co. Stanford.	Wheat bran, wheat shorts, corn, wheat, molasses, kaffir screenings 20%, corn feed meal, meat meal, prime peanut meal, calcium carbonate ½%, salt ½%	Oat hulls, oat grains, barley grain, corn gluten feed and weed seeds present in addition to guaranteed ingredients. Peanut meal not found. Below guaranty in protein and fat.
2262-20	Leitchfield Milling Co. Leitchfield.	Same	No whole wheat or corn as guaranteed. No peanut meal, no kaffir screenings. Below guaranty in protein.
3237-21	The Mahan Co. Winchester.	Corn, oats, alfalfa, molasses	Below guaranty in fat and above in fiber.
643-19	Powell-Hackney Grocery Co., Hazard.	Same	
649-19	Jellico Grocery Co. Manchester.	Same	

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
3239-21	Peter's 24% Dairy Feed	M. C. Peter's Mill Co.	25.88	5.36	8.45
		Omaha, Neb.	24.00	4.50	10.00
657-20	Peter's Hog Profit Swine Feed	Same	17.56	3.19	5.83
			17.00	4.00	7.00
2690-20	Emerald Horse Feed	Prairie State Milling Co	10.25	2.08	12.32
		Chicago, Ill.	9.00	2.00	12.00
2690-20	Same	Same	9.25	2.09	13.37
			9.00	2.00	12.00
2691-20	Greenfield Horse Feed	Same	9.00	1.00	20.05
			9.00	0.50	18.00
2691-20	Greenfield Horse Feed	Same	9.00	1.00	20.05
			9.00	0 50	18.00
3119-18	Pratts Calf Meal	Pratt Food Co.	24.94	6.63	6.88
		Philadelphia, Pa.	25.00	5.00	6.00
2210-18	Brown Mule Feed with Molasses	Ralston Purina Co.	9.75	3.18	13.83
		St. Louis, Mo.	9.00	1.50	15.00
1703-18	Purina O'Molene Feed	Same	10.88	3.81	9.03
			9.70	3.20	8.00
557-19	Same	Same	10.63	3.86	7.49
			9.70	3.20	8.00
557-20	Same	Same	10.75	3.82	8.43
			9.70	3.20	8.00
291-20	Purina Feed with Molasses	Same	9.75	2.56	11.45
			9.00	1.50	15.00
645-18	XX Good Feed with Molasses	Same	10.25	2.66	12.93
			9.00	1.50	15.00
645-18	Same	Same	10.38	2.23	13.63
			9.00	1.50	15.00
1478-19	Purina Cow Chow Feed	Same	24.19	4.85	12.98
			24.00	4.30	12.00
1478-19	Same	Same	25.38	5.73	12.76
			24.00	4.30	12.00
1478-19	Same	Same	24.25	6.60	13.28
			24.00	4.30	12.00
1478-19	Same	Same	27.63	4.93	11.84
			24.00	4.30	12.00
1478-19	Same	Same	25.38	3.88	11.20
			24.00	4.30	12.00
1233-20	Purina Pig Chow	Same	17.00	3.99	6.65
			15.00	2.50	9.00
2940-21	Rapier's Teamster Horse and Mule Feed	Rapier Sugar Feed Co.	11.50	4.15	8 44
		Owensboro, Ky.	10.00	3.00	12.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
3239-21	The Mahan Co. Winchester.	Cotton seed meal, corn feed meal, ground barley, oil meal, alfalfa meal, molasses	
657-20	Same	Corn feed meal, ground barley, wheat middlings, oil meal, meat meal, alfalfa meal	Ground barley contains wild oats. Below guaranty in fat.
2690-20	W. J. Riedling & Co. Louisville.	Rolled oats, cracked corn, alfalfa meal, molasses	
2690-20	R. D. Riedling Louisville.	Same	Above guaranty in fiber.
2691-20	Same	Alfalfa meal, molasses	Small amount of oat hulls present. Above guaranty in fiber.
2691-20	R. D. Riedling Louisville.	Alfalfa meal, molasses	Small amount of oat hulls present. Above guaranty in fiber.
3119-18	Louisville Hay & Grain Co., Louisville.	Wheat flour, hominy feed, ground flaxseed, blood flour, Fenugreek, recleaned cotton seed meal, cocoa shell meal, locust bean meal, anise beans, peas, salt	
2210-18	Jellico Grocery Co. Corbin.	Cracked corn, ground alfalfa, molasses, oats, salt 1%	
1703-18	Henderson Feed & Commission Co., Henderson.	Same	Above guaranty in fiber.
557-19	Powell-Hackney Grocery Co., Hazard.	Same	
557-20	Danville Ice and Coal Co. Danville.	Same	
291-20	McKeel & Thurmond Murray.	Same	
645-18	W. W. Broaddus & Co. Richmond.	Same	
645-18	Henderson Feed & Commission Co., Henders'n.	Same	
1478-19	Danville Ice & Coal Co. Danville.	Linseed oil meal (old process), gluten feed from corn, hominy feed, cotton seed meal, ground alfalfa, molasses, salt 1%	Above guaranty in fiber.
1478-19	Jas. M. Wright & Son Franklin.	Same	Same.
1478-19	Henderson Feed & Commission Co., Henders'n.	Same	Same.
1478-19	Carter Supply Co. Lexington.	Same	
1478-19	Danville Ice & Coal Co. Danville.	Same	
1233-20	W. W. Broaddus & Co. Richmond.	Hominy feed, cane molasses, corn meal, gluten feed from corn, digester tankage, old process linseed oil meal, ground alfalfa, charred peat 2%, salt 1%	
2940-21	Morehead Grocery Co. Morehead.	Corn, oats, alfalfa meal, cane molasses, salt 1%	

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
420-20	Rapier's Red Wing Horse and Mule Feed	Rapier Sugar Feed Co.	11.00	2.43	14.64
		Owensboro, Ky.	9.00	2.00	12.00
421-19	Rapier's Otene Horse and Mule Feed	Same	9.25	1.76	14.23
			9.00	2.00	12.00
421-20	Same	Same	11.75	2.79	14.40
			9.00	2.00	12.00
421-20	Same	Same	10.75	2.40	15.75
			9.00	2.00	12.00
422-19	Rapier's Creamo Dairy Feed	Same	16.75	3.61	11.05
			16.50	3.50	16.00
422-20	Same	Same	18.00	3.30	16.30
			16.50	3.50	16.00
422-20	Same	Same	18.88	3.88	13.82
			16.50	3.50	16.00
422-20	Same	Same	18.50	3.98	15.45
			16.50	3.50	16.00
422-20	Same	Same	19.63	3.79	14.68
			16.50	3.50	16.00
423-19	Rapier's Pig Meal	Same	17.63	2.09	11.64
			12.00	2.50	12.00
423-19	Same	Same	12.63	3.20	13.19
			12.00	2.50	12.00
1601-18	Rapier's Honey Meal	Rapier Sugar Feed Co.	12.13	1.23	22.10
		Owensboro, Ky.	9.00	1.00	18.00
1296-19	Vitality Horse Feed	Rosenbaum Bros.	11.38	2.33	13.40
		Chicago, Ill.	10.00	2.00	15.00
1296-19	Same	Same	10.13	2.05	14.25
			10.00	2.00	15.00
1296-19	Same	Same	11.00	2.14	17.84
			10.00	2.00	15.00
1295-19	Will-Pay Dairy Feed	Same	17.13	3.35	20.61
			16.00	3.50	14.00
1295-19	Same	Same	17.88	4.13	13.40
			16.00	3.50	14.00
2917-20	Will-Pay Dairy Ration	Same	20.75	3.96	10.18
			20.00	4.00	12.00

Analyses of Inspectors' Samples.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
420-20	London Grocery Co. .... London.	Cracked corn, alfalfa meal, oats, cane molasses, salt 1%	Above guaranty in fiber.
421-19	Electric Mills Co. ...... Franklin.	Same	Same.
421-20	Anderson & Spillman ... Danville.	Same	Grain moldy and partially decayed. Above guaranty in fiber.
421-20	W. E. Cook .... Whitesburg.	Same	Above guaranty in fiber.
422-19	Electric Mills Co. .... Franklin.	Cotton seed meal, linseed meal, alfalfa meal, molasses, ground and bolted wheat and corn screenings 35%, salt 1%	
422-20	Anderson & Spillman ... Danville.	Same	Grain moldy and partially decayed.
422-20	Engle-Given Coal Co. ... Lexington.	Same	No linseed oil meal present. Feed has a musty odor.
422-20	W. E. Cook .... Whitesburg.	Same	
422-20	Hudson & Farnan ...... Lancaster.	Same	Contains oat by-product such as oat hulls and oat middlings and kaffir corn screenings or sorghum grain screenings. No linseed oil meal present.
423-19	Anderson & Spillman ... Danville.	Louisiana cane molasses, alfalfa leaf meal, old process linseed oil meal, recleaned ground wheat and corn screenings 35%, corn feed meal, salt 1%	Alfalfa meal instead of alfalfa leaf meal. This feed in bad condition, has a strong odor of mould.
423-19	J. N. Penick .... Elkton.	Same	Alfalfa meal instead of alfalfa leaf meal. Above guaranty in fiber.
1601-18	R. M. Harrison & Son .. Maysville.	Cane molasses, alfalfa meal, salt ½%	Above guaranty in fiber.
1296-19	Wm. P. Miller .... Louisville.	Sifted cracked corn, crushed oats, crushed barley, alfalfa meal, molasses	
1296-19	Same	Same	
1296-19	S. C. Jennings .... Madisonville.	Same	Above guaranty in fiber.
1295-19	The Mahan Co. .... Hazard.	Old process linseed oil meal, cotton seed meal, corn, gluten feed (ground and bolted wheat, barley and kaffir corn screenings) 45%, corn feed meal, molasses, salt 1%	Same.
1295-19	Edw. M. Riedling ...... Louisville.	Same	
2917-20	Same	Old process linseed oil meal, cotton seed meal, corn gluten feed, corn feed meal, (ground wheat, barley and kaffir corn screenings) 25%, wheat bran, calcium carbonate 1%, molasses, salt	In addition to guaranteed ingredients this feed contains oat hulls and alfalfa meal.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1294-19	Vitality Dairy Feed	Rosenbaum Bros.	24.88	5.20	11.78
		Chicago, Ill.	20.00	4.00	9.00
1992-19	"77" Dairy Feed	Same	24.50	4.45	13.91
			20.00	4.00	12.00
2322-20	Roszbro Horse and Mule Feed	Roszell Bros.	10.63	4.10	7.22
		Lexington, Ky.	9.00	3.00	12.00
366-20	"Big S" Horse Feed	Security Mill & Feed Co.	10.00	3.32	7.70
		Knoxville, Tenn.	10.40	4.00	8.00
367-20	Security Horse Feed	Same	10.63	3.15	9.56
			10.00	3.00	10.00
2031-19	Simmons Molasses Chop	Simmons Milling Co.	12.13	4.43	9.89
		Cincinnati, Ohio.	10.00	2.50	12.00
1960-19	Simco 24 Dairy Feed	Same	24.63	4.66	10.80
			24.00	5.00	10.00
1960-19	Same	Same	25.63	5.01	10.30
			24.00	5.00	10.00
1232-20	Simco Hog Feed	Same	20.75	4.11	5.40
			20.00	5.00	7.00
1232-20	Same	Same	21.25	4.94	6.70
			20.00	5.00	7.00
2723-18	"Sistrunk's Pride" Horse and	W. T. Sistrunk & Co.	11.25	2.51	16.43
	Mule Feed	Lexington, Ky.	9.00	1.50	18.00
1153-20	Cow Feed	J. Allen Smith & Co.	16.88	4.14	7.47
		Knoxville, Tenn.	15.00	3.50	8.00
2161-19	Mixed Feed	Sonora Milling Co.	15.38	4.38	8.00
		Sonora, Ky.	13.23	4.00	11.00
2161-20	A Balanced Ration	Same	12.63	3.67	15.12
			13.23	4.00	11.00
493-20	Atlas Horse and Mule Feed	Southern Seed Co.	13.00	2.80	13.09
		Louisville, Ky.	10.00	2.50	12.00
494-20	Atlas Dairy Feed	Same	18.75	3.25	20.73
			18.00	3.00	18.00
494-20	Same	Same	23.88	3.90	13.13
			18.00	3.00	18.00
2087-19	Standard Dairy Feed	Same	27.13	4.76	16.36
			24.00	3.00	16.00
1910-19	Caramel Flakes	Same	14.25	3.13	7.70
			11.00	3.00	9.00
2869-20	Vertex Alfalfa Horse Feed	The Sugarine Co.	11.00	3.41	11.77
		Owensboro, Ky.	10.00	2.50	12.00
2868-20	High Grain Alfalfa Horse Feed	Same	11.13	3.48	8.80
			10.00	2.50	12.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1294-19	Edw. M. Riedling ...... Louisville, Ky.	Wheat bran, wheat middlings, corn gluten feed, corn feed meal, old process linseed oil meal, cotton seed meal, ground oats, ground barley, salt 1%	Above guaranty in fiber.
1992-19	Blaisus Duechle .... Covington.	Old process linseed oil meal, gluten feed from corn, hominy feed, cotton seed meal, alfalfa meal, molasses, salt 1%	Above guaranty in fiber.
2322-20	Bacon R. Moore .... Torrent.	Oats, cracked corn, molasses, alfalfa, salt 1%	Oats contain pin oats.
366-20	The Bryant Feed Co. ... Corbin.	Corn, oats, alfalfa meal, molasses, salt	Below guaranty in fat.
367-20	H. T. Hackney Co. ..... Middlesboro.	Same	
2031-19	Danville Ice & Coal Co.. Danville.	Molasses, corn, rolled oats, alfalfa meal, Brewer's grains......	Contains wheat bran.
1960-19	M. D. Royse .... Winchester.	Wheat bran, wheat middlings, corn feed meal, old process linseed meal, cotton seed meal, dried brewers' grains, corn gluten feed, salt	Above guaranty in fiber.
1960-19	Garrard-Lincoln Produce Co., Lancaster.	Same	
1232-20	T. W. Jones .... Stanford.	Corn gluten, wheat and rye middlings, corn meal, hominy feed, old process linseed oil meal, digester tankage, salt	Below guaranty in fat.
1232-20	Same	Same	Peanut meal present.
2723-18	Mfrs. Warehouse	Corn, oats, alfalfa meal, molasses,	
1153-20	H. T. Hackney Co. .... Harlan.	Wheat bran, wheat shorts, corn bran, corn meal, ground wheat screenings 1%	
2161-19	C. L. Jewell .... Horse Cave.	Corn, oats, barley, mill run bran, shorts	Contains screenings from corn, oats, barley and wheat.
2161-20	Shaw & Reynolds ...... Cave City.	Corn, oats, barley, mill run bran, and shorts	Below guaranty in protein and above in fiber. Adulterated with oat hulls. No barley present. Corn cockle found.
493-20	London Grocery Co. .... London.	Alfalfa, oats, corn, molasses, salt ½%	Above guaranty in fiber.
494-20	R. S. Van Arsdell & Co.. Harrodsburg.	Alfalfa meal, cotton seed meal, corn meal, molasses, salt ½%	Above guaranty in fiber. Whole and crushed oat and barley grains present.
494-20	T. Y. Flora .... Paris.	Same	Excess of alfalfa stems.
2087-19	R. S. Van Arsdell & Co.. Harrodsburg.	Brewers' dried grains, cotton seed meal, alfalfa meal, molasses, salt ½%	Excess of cotton seed hulls.
1910-19	J. A. Bennett .... Taylorsville.	Wheat bran, cane molasses, salt.	
2869-20	Riverside Co. .... Beattyville.	Molasses, alfalfa, corn, barley, oats, salt	
2868-20	Same	Same	

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2015-19	Sugarine Horse Feed (with Alfalfa)	The Sugarine Co.	10.88	3.52	11.88
		Owensboro, Ky.	10.00	2.50	12.00
2016-19	Ideal Horse Feed (with Alfalfa).	Same	11.25	2.75	16.88
			10.00	2.50	12.00
2014-19	Suco Dairy Feed	Same	24.25	4.95	14.12
			25.00	5.00	12.00
2014-20	Same	Same	24.13	3.95	8.60
			20.00	4.00	10.00
2014-20	Same	Same	23.25	3.58	8.40
			20.00	4.00	10.00
3380-21	Universal Feed	Same	12.75	4.28	8.98
			12.00	3.50	8.00
2020-19	Sugarine Hog Meal	Same	19.50	4.80	7.55
			18.00	4.00	10.00
2651-20	Suco Hog Meal	Same	16.75	5.27	7.39
			14.00	4.00	9.00
2651-20	Same	Same	16.50	5.97	9.35
			14.00	4.00	9.00
2651-20	Same	Same	16.13	4.58	9.10
			14.00	4.00	9.00
2023-19	Sugarine Calf Meal	The Sugarine Co.	18.00	4.72	4.25
		Peoria, Ill.	20.00	4.00	3.00
2512-20	Angle Horse and Mule Feed	Triangle Milling Co.	11.13	2.08	15.40
		North Kansas City, Mo.	9.00	1.50	16.00
131-19	Union Grain (Ubiko) Biles Ready Dairy Ration	The Ubiko Milling Co.	23.19	4.70	10.50
		Cincinnati, Ohio.	24.00	5.00	10.00
131-19	Same	Same	25.25	5.43	9.40
			24.00	5.00	10.00
131-19	Same	Same	26.00	6.42	9.08
			24.00	5.00	10.00
131-19	Same	Same	25.63	6.76	9.35
			24.00	5.00	10.00
2367-20	Big Value Horse and Mule Feed.	John Wade & Sons	13.00	3.10	17.74
		Memphis, Tenn.	9.00	1.50	20.00

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2015-19	Pikeville Grocery Co. Pikeville.	Molasses, alfalfa, corn, oats, barley, salt ½%	
2016-19	C. C. Hoskins London.	Same	Above guaranty in fiber.
2014-19	The Thompson Grocery Co., Pineville.	Molasses, alfalfa meal, linseed meal, cocoanut meal, corn feed meal, ground barley, cotton seed meal, prime peanut meal, calcium carbonate ½%, salt ½%	Above guaranty in fiber. Wheat product present. No ground barley or prime peanut meal found. Below guaranty in protein.
2014-20	The Perry Feed & Commission Co., Hazard.	Wheat bran, linseed meal, prime cotton seed meal, prime peanut meal, cocoanut meal, corn feed meal, molasses, alfalfa meal, calcium carbonate ½%, salt ½% c.	
2014-20	R. B. Hayes & Co. Hodgenville.	Same	
3380-21	F. H. Gordon Richmond.	Wheat bran, gray middlings, germ oil meal, corn feed meal, meal, ground oats	Above guaranty in fiber.
2020-19	Mitchell & Kenny Danville.	Molasses, alfalfa meal, corn feed meal, corn germ meal, linseed meal, ground barley, ground and bolted wild buckwheat and wheat, soluble blood flour, prime peanut meal, cocoanut meal, calcium carbonate ½%, salt ½%	Small amount of oats and wild mustard present.
2651-20	Riverside Co. Beattyville.	Molasses, alfalfa meal, corn feed meal, corn germ meal, ground barley, linseed meal, soluble blood flour, wheat middlings, ground wild buckwheat, wheat, calcium carbonate ½%, salt ½%	No whole wheat present.
2651-20	The Mahan Co. Hazard.	Same	Same.
2651-20	Maraman & Son Shepherdsville.	Same	
2023-19	T. W. Jones Stanford.	Soluble blood flour, bone meal, soluble starch, malt flour, dried buttermilk, wheat middlings, corn feed meal, linseed meal	Below guaranty in protein. Screenings containing oat hulls and weed seeds present. No bone meal or buttermilk present. Above guaranty in fiber.
2512-20	Enterprise Coal & Ice Co. Shively.	Cracked corn, crushed oats, alfalfa meal, cane molasses, salt ½%	
131-19	J. C. Everett & Co. Maysville.	Fourex corn distillers' dried grains, choice cotton seed meal, old process linseed oil meal, white wheat middlings, winter wheat bran, hominy meal, cocoanut oil meal, corn gluten feed, brewers' dried grains, barley malt sprouts, fine table salt ½%	Below guaranty in protein.
131-19	Same	Same	Corn distillers' dried grains and cocoanut oil meal not present.
131-19	Danville Ice & Coal Co. Danville.	Same	
131-19	Scottsville Produce Co. Scottsville.	Same	
2367-20	Marshall County Milling Co., Benton.	Corn, oats, alfalfa meal, molasses salt	Weed seeds present.

TABLE IV.—MISCELLANEOUS MIXED FEEDS.

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2367-20	Big Value Horse and Mule Feed..	John Wade & Son	12.25	3.33	15.46
		Memphis, Tenn.	**9.00**	**1.50**	**20.00**
2367-20	Same	Same	11.75	2.93	16.10
			9.00	**1.50**	**20.00**
2367-20	Same	Same	10.25	2.45	13.36
			9.00	**1.50**	**20.00**
2369-20	24% Protein Dairy Feed	Same	29.13	6.27	10.50
			24.00	**4.00**	**14.00**
3054-20	"Winner" Brand Fine Feed....	Winner Mill Co., Winner Feed Co. Prop.............	13.13	3.88	4.95
		Chattanooga, Tenn.	**15.00**	**6.00**	**10.00**

ANALYSES OF INSPECTORS' SAMPLES.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2367-20	Johnson Bros. .... Benton	Corn, oats, alfalfa meal, molasses, salt.	Weed seeds present.
2367-20	McKeel & Thurmond ... Murray.	Same	Same.
2367-20	E. M. Ford & Sons ..... Cave City.	Same	
2369-20	Same	Corn meal, cotton seed meal, linseed oil meal, wheat bran, wheat shorts, alfalfa meal, molasses, salt ½%...	
3054-20	Kentucky Feed & Grain Co., Middlesboro.	Wheat bran, wheat shorts, rye shorts, corn meal, hominy feed, rice bran ..	Below guaranty in protein. No rye middlings or rice bran present.

TABLE V.—MISCELLANEOUS MIXED FEEDS CONTAINING

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
	Miscellaneous Mixed Feeds Containing a Material of Little or no Feeding Value				
312-19	Acme Stock Feed	Acme-Evans Co. Indianapolis, Ind.	10.25 9.00	3.87 3.50	10.69 10.00
114-19	Big X Dairy Feed	Acme-Jones Co., Inc. Louisville, Ky.	16.75 15.50	4.24 4.00	13.10 14.00
479-19	Full Pail Dairy Feed	Alfocorn Milling Co. St. Louis, Mo.	13.50 16.00	4.88 3.00	13.88 15.00
479-19	Same	Same	19.63 16.00	4.62 3.00	13.85 15.00
378-19	Ideal Horse Feed	American Milling Co. Peoria, Ill.	10.63 10.00	2.92 2.50	13.83 14.00
3028-18	Homco Hog and Shoat Meal	American Hominy Co. Decatur, Ill.	20.50 18.00	4.20 4.00	13.13 12.00
2105-19	Arcady (R. K. D.) Hog Meal and Peat	Arcady Farms Milling Co. Chicago, Ill.	18.38 18.00	6.15 5.00	8.25 10.00
2352-19	Mountain Bay Horse Feed	Ashland Milling Co. Ashland, Ky.	10.63 9.00	2.36 1.00	11.21 18 00
548-20	Badenoch's C. & O. Stock Feed	J. J. Badenoch Co. Chicago, Ill.	12.75 8.00	3.83 3.00	13.08 12.00
526-20	Milky Way Dairy Ration	Same	23.00 20.00	4.90 5.00	12.58 12.00
3022-20	Honey B Dairy Feed	Same	18.63 16.00	3.67 3.00	11.85 15.00
204-19	Nutro Sweet Feed	The Corno Mills Co. St. Louis, Mo.	10.00 8.00	2.26 2.00	13.84 18.00
204-20	Same	Same	9.63 8.00	2.52 2.00	15.22 18.00
204-20	Same	Same	8.25 8.00	2.44 2.00	16.00 18.00
204-20	Same	Same	10.25 8.00	2.83 2.00	13.18 18.00

A Material of Little or No Feeding Value.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
312-19	Jellico Grocery Co. ..... Corbin.	Corn, homlik (corn feed meal), wheat bran, wheat middlings, hominy meal, (oat middlings and oat hulls) 30%, salt	No wheat bran or wheat middlings present. High in fiber.
114-19	Morgan & Crenshaw .... Georgetown.	Hominy feed, gluten feed, cotton seed meal, oat hulls 20%, wheat bran, wheat middlings, linseed oil meal, salt	Below guaranty in protein.
479-19	Louisville Hay & Grain Co., Louisville.	Cotton seed meal, clipped oat by-product 20%, ground and bolted grain screenings 10%, brewers' dried grains, alfalfa meal, molasses	
479-19	W. T. Sistrunk & Co. ... Lexington.	Same	
378-19	Lake Bros. .... Springfield.	Molasses, alfalfa, corn, oats, (oat middlings, oat shorts and oat hulls) 10%	
3028-18	R. D. Riedling .... Louisville.	Wheat middlings, tankage, alfalfa, molasses, hominy feed, velvet bean feed, (velvet bean meal, velvet bean hulls) 31%	Above guaranty in fiber.
2105-19	Kentucky Feed & Grain Co., Louisville.	Wheat middlings, linseed oil meal, digester tankage, corn feed meal, corn germ meal, cleaned, ground and bolted grain screenings 20%, molasses, peat 5%, salt 1%	
2352-19	Mfrs. Warehouse	Corn, oats, alfalfa, molasses, (oat middlings and oat hulls) 13%, salt ...	No oat middlings found.
548-20	The Cincinnati Grain & Hay Co., Erlanger.	Hominy feed, corn feed meal, (oat middlings, oat shorts and oat hulls) 5%, ground barley, salt	Above guaranty in fiber.
526-20	Bush & Pritchard ...... Ashland.	Wheat bran, wheat middlings, linseed oil meal, cotton seed meal, gluten feed, clipped oat by-product 17½%, corn feed meal, ground barley, peanut meal, salt, calcium phosphate ½%	Above guaranty in fiber.
3022-20	Williams Feed Co. ..... Pikeville.	Cotton seed meal, corn gluten feed, old process oil meal, peanut meal, ground oats, (oat middlings, oat shorts and oat hulls) 20%, ground barley, corn feed meal, wheat bran, wheat middlings, ground wheat screenings 1%, alfalfa meal, molasses, calcium carbonate 1%, salt..	
204-19	Lewis Wholesale Co. ... Whitesburg.	Ground alfalfa, cracked corn, whole oats, crushed (oat middlings, oat shorts and oat hulls) 20%, molasses.	
204-20	Burg Kinner .... Greenup.	Same	
204-20	The Mahan Co. .... Hazard.	Same	
204-20	Jellico Grocery Co. ..... Corbin.	Same	

TABLE V.—MISCELLANEOUS MIXED FEEDS CONTAINING

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
204-20	Nutro Sweet Feed	The Corno Mills Co.	9.75	2.87	13.58
		St. Louis, Mo.	8.00	2.00	18.00
216-19	Pawnee Sweet Feed	Same	9.75	2.97	12.58
			10.00	2.00	19.00
224-19	Green Flag Sweet Feed	Shamrock Mills, The Corno	11.13	1.83	14.81
		Mills Co., St. Louis, Mo.	10.00	2.00	19.00
2526-20	Killarney Sweet Dairy Feed	The Corno Mills Co.	20.88	4.17	13.90
		St. Louis, Mo.	16.00	3.50	15.00
2493-20	Pawnee Sweet Dairy Feed	Same	21.50	4.04	14.65
			20.00	3.50	13.50
2357-20	Nutro Sweet Dairy Feed	Same	21.50	3.87	15.30
			16.00	3.50	15.00
2357-20	Same	Same	21.25	4.34	15.66
			16.00	3.50	15.00
2912-18	Velvet Bean Feed	Dawson Cotton Oil Co.	17.13	3.99	14.00
		Dawson, Ga.	17.00	4.00	15.00
8-20	Diamond Hog and Pig Meal	Diamond Mills	20.75	4.65	10.50
		Evansville, Ind.	20.00	5.00	10.00
60-19	Diamond Dairy Feed	Dixie Mills Co.	16.13	5.87	14.66
		E. St. Louis, Ill.	16.50	3.50	17.00
6019	Same	Same	16.56	7.73	12.00
			16.50	3.50	17.00
6019	Same	Same	13.50	5.03	14.30
			16.50	3.50	17.00
2940-18	Red Crown Dairy Feed	Fisher Bros.	17.25	3.27	19.66
		Evansville, Ind.	16.00	3.00	17.00
8-19	Diamond Hog and Pig Meal	Same	20.88	5.34	11.98
			20.00	5.50	12.00
8-19	Same	Same	19.38	4.90	8.62
			20.00	5.00	12.00
8-19	Same	Same	18.75	4.80	9.93
			20.00	5.00	12.00
1952-19	Red Crown Hog and Pig Meal	Same	18.00	5.18	14.92
			17.00	5.00	17.00
1952-19	Same	Same	17.88	5.81	15.63
			17.00	5.00	17.00

A MATERIAL OF LITTLE OR NO FEEDING VALUE.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
204-20	Hurst & Co. Lexington.	Ground alfalfa, cracked corn, whole oats, crushed oats, (middlings, oat shorts and oat hulls) 20% molasses.	Comparatively small amount of grain as compared with alfalfa and oat feed.
216-19	Herbert Hawkins Paducah.	Whole oats crushed, ground choice alfalfa, cracked corn, (oat middlings, oat shorts and oat hulls) 15%, molasses	The (oat middlings, oat shorts and oat hulls) contained in this feed are practically oat hulls.
224-19	McKeel & Thurmond Murray.	Whole oats crushed, ground choice alfalfa, cracked corn, (oat middlings, oat shorts and oat hulls) 15%, molasses	
2526-20	Harlan Grocery & Grain Co., Harlan.	Wheat bran, cotton seed meal, (oat middlings, oat shorts and oat hulls) 20%, alfalfa meal, molasses	Contains linseed oil meal in addition to guaranteed ingredients.
2493-20	J. E. Stone & Co. Lexington.	Gluten feed, cotton seed meal, wheat bran, (oat middlings, oat shorts and oat hulls) 14%, choice alfalfa meal, linseed meal, molasses, salt 1%	Above guaranty in fiber.
2357-20	Same	Wheat bran, cotton seed meal, (oat middlings, oat shorts and oat hulls) 20%, alfalfa meal, molasses	
2357-20	Burg Kinner Greenup.	Same	Above guaranty in fiber. Some weed seed present.
2912-18	Thomas Jameson & Son. Beattyville.	Velvet bean meal, velvet bean hulls 40%	
8-20	N. I. Toombs Madisonville.	Digester tankage, wheat middlings, linseed oil meal, cotton seed meal, corn feed meal, velvet bean meal, velvet bean hulls 6%, hominy meal, salt ½%	Above guaranty in fiber.
60-19	Same	Cotton seed meal, clipped oat by-product 30%, ground flax seed screenings 40%, molasses	
60-19	J. K. Bryant Crofton.	Same	Rice bran present.
60-19	Oscar Farmer & Sons Louisville.	Same	Below guaranty in protein.
2940-18	Forbes Mfg. Co. Hopkinsville.	Alfalfa meal, molasses, corn feed meal, wheat bran, wheat middlings, hominy feed, linseed oil meal, cotton seed hulls 15%, salt ½%	No linseed oil meal found. Above guaranty in fiber.
8-19	Park City Feed Store Bowling Green.	Digester tankage, wheat middlings, linseed oil meal, cotton seed meal, corn feed meal, peanut meal, peanut hulls 8%, hominy feed, salt ½%	
8-19	J. J. Shaver Mayfield.	Digester tankage, wheat middlings, linseed oil meal, cotton seed meal, corn feed meal, velvet bean meal, velvet bean hulls 10%, salt 1%	Below guaranty in protein.
8-19	Marion Milling Co. Marion.	Same	Same.
1952-19	T. M. Wooldridge Hopkinsville.	Digester tankage, wheat middlings, corn feed meal, peanut meal, peanut hulls 5%, cotton seed meal, delinted cotton seed hulls 10%, palm oil, salt ½%	
1952-19	Dunbar & Henry Princeton.	Same	

TABLE V.—MISCELLANEOUS MIXED FEEDS CONTAINING

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2909-18	Fat Back Hog Feed	Golden Grain Milling Co.	19.88	4.38	9.85
		East St. Louis, Ill.	18.00	4.00	10.00
689-19	Gold Flake Dairy Feed	Hales & Edwards Co.	14.25	3.23	16.23
		Chicago, Ill.	16.00	3.50	15.00
689-19	Same	Same	16.63	2.18	9.58
			16.00	3.50	15.00
689-19	Same	Same	18.00	3.16	13.19
			16.00	3.50	15.00
689-19	Same	Same	14.13	4.13	14.85
			16.00	3.50	15.00
689-19	Same	Same	15.38	2.87	16.49
			16.00	3.50	15.00
992-19	Honor Horse Feed	International Sugar Feed No.	10.63	3.88	9.45
		Two Co., Minneapolis, Minn.	11.00	3.00	22.00
989-19	International Jewel Dairy Feed	Same	11.25	2.76	12.65
			9.00	2.00	15.00
1004-19	Makmeat "Hog Feed"	Same	16.25	9.18	10.93
			15.00	5.00	12.50
1005-19	International Special Dairy Feed	Same	15.25	3.63	13.25
			15.00	4.50	12.50
1005-20	Same	Same	15.75	4.59	9.63
			15.00	4.50	12.50
2676-20	Barley Mixed Feed with Screenings and Hulls	T. G. Jewett & Sons	14.63	4.75	11.82
		Portsmouth, Ohio.	11.50	3.00	15.00
2270-19	Kiblers Butter Fat Dairy Feed	F. W. Kibler Milling	21.00	4.85	11.40
		Mt. Orab, Ohio.	20.00	4.00	14.00
2705-20	Badger Palmor Horse Feed	Chas. A. Krause Milling Co.	11.13	1.92	19.02
		Milwaukee, Wis.	9.00	1.00	16.00
1705-20	Badger Stock Feed	Same	10.50	3.04	11.62
			10.00	3.25	12.00
1257-20	Badger Dairy Feed	Same	16.00	4.78	20.19
			16.50	3.50	18.00

A MATERIAL OF LITTLE OR NO FEEDING VALUE.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2909-18	The Mahan Co. Winchester.	Wheat middlings, wheat bran, digester tankage, meat meal, linseed oil meal, corn oil cake meal, ground grain screenings 15%, molasses, charred peat 5%, alfalfa leaf meal, corn feed meal	
689-19	Pulaski County Mill & Grain Co., Somerset.	Cotton seed meal, corn gluten feed, linseed oil meal, molasses, clipped oat by-product 25%, ground and bolted wheat, barley and kaffir corn screenings 25%, salt	Below guaranty in protein and above in fiber.
689-19	Harrodsburg Ice & Produce Co., Harrodsb'g.	Same	Below guaranty in fat. Weed seed present.
689-19	H. E. Bailey & Son Lancaster.	Same	
689-19	Taulbee & Co. Hazard.	Same	Below guaranty in protein.
689-19	W. W. Broaddus & Co. Richmond.	Same	Below guaranty in protein and fat and above in fiber.
992-19	M. D. Royse Winchester.	Cracked corn, oats, alfalfa meal, cotton seed meal, oat middlings, oat shorts and oat hulls) 20%, salt	No cotton seed meal present.
989-19	Elizabethtown Milling Co., Elizabethtown.	Corn feed meal, clipped oat by-products 60%, alfalfa meal, cotton seed meal, molasses, salt	
1004-19	Goff & Bush Winchester.	Linseed oil meal, digester tankage, ground and bolted grain screenings 50%, wheat bran, rice bran, corn feed meal, velvet bean meal, velvet bean hulls 15%, salt	
1005-19	W. W. Broaddus & Co. Richmond.	Cotton seed meal, molasses, ground clipped oat by-product 15%, ground and bolted grain screenings 35%, linseed oil meal, corn gluten feed, wheat bran, salt	Above guaranty in fiber. Very little gluten feed present. Weed seed present. Below guaranty in fat.
1005-20	David C. Frost & Duvall Lexington.	Same	
2676-20	Staggs Bros. & Co. Vanceburg.	Barley hulls 25%, barley bran, barley middlings, barley screenings 20%	Contains ground oats.
2270-19	R. M. Harrison & Son Maysville.	Cotton seed meal, cocoanut oil meal, gluten feed, corn meal, wheat bran, old process oil meal, hominy feed, (oat middlings, oat shorts and oat hulls) 10%, wheat middlings, malt sprouts, salt ½%	No cocoanut oil meal, corn meal, hominy feed or malt sprouts found. Rye middlings and unground wheat screenings found.
2705-20	C. J. Clausen Louisville.	Oats, corn, alfalfa meal, (oat middlings, oat shorts and oat hulls) 10%, molasses, flax plant by-product 10%, salt	(Oat middlings, oat shorts and oat hulls) largely oat hulls. Above guaranty in fiber.
1705-20	Same	Hominy feed, corn flour, corn germ meal, kaffir, wheat bran, wheat middlings and screenings, (oat hulls, oat shorts and oat middlings) 20%, old process linseed oil meal, salt	No linseed oil meal or wheat middlings and screenings found.
1257-20	Kenton Hay & Grain Co. Covington.	Cotton seed meal, alfalfa meal, ground and bolted wheat screenings 20%, flax plant by-product 25%, molasses, salt	Above guaranty in fiber.

TABLE V.—MISCELLANEOUS MIXED FEEDS CONTAINING

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
1877-19	Special Palmo Mixed Feed	Newsome Feed & Grain Co.	11.50	5.09	15.93
		Pittsburg, Pa.	**10.00**	**5.00**	**18.00**
1877-19	Same	Same	13.38	5.60	14.20
			10.00	**5.00**	**18.00**
1545-19	Domino Butterine Dairy Feed	Nowak Milling Corporation.	17.50	4.65	13.20
		Buffalo, N. Y.	**17.00**	**3.50**	**14.00**
1733-19	"Sunny South" Horse and Mule Feed	Owensboro Products Co.	10.13	2.38	15.50
		Owensboro, Ky.	**9.00**	**2.00**	**16.00**
1580-19	"O. P. No. One" Horse and Mule Feed	Same	9.75	2.40	12.98
			9.00	**2.50**	**12.00**
1581-19	"O. P. No. One" Dairy Feed	Same	21.00	5.20	10.18
			16.50	**3.50**	**14.00**
1581-19	Same	Same	17.00	4.55	12.15
			16.50	**3.50**	**14.00**
1584-19	"O. P. Co." Fat Maker	Same	13.25	3.34	8.93
			9.00	**3.00**	**14.00**
340-19	Dairy Feed	D. F. Potts	13.75	3.73	9.06
		Lyons, Ky.	**11.19**	**3.09**	**12.50**
340-19	Same	Same	16.25	3.58	9.62
			11.19	**3.09**	**12.50**
2480-20	Schumacher Special Horse Feed	The Quaker Oats Co.	10.25	3.42	7.32
		Chicago, Ill.	**9.25**	**3.25**	**8.00**
1723-19	Green Cross Horse Mixed Feed with Molasses	Same	10.63	2.76	12.47
			10.00	**2.50**	**13.50**
1723-19	Same	Same	11.00	2.29	14.79
			10.00	**2.50**	**13.50**
1490-15	Golden Sweet Mule Feed	Same	10.75	2.58	16.43
			9.00	**2.00**	**15.00**
2579-17	"Big Q" Dairy Ration	Same	22.50	4.44	12.85
			21.00	**2.50**	**15.00**
883-17	Mogul Mixed Molasses Feed	Same	11.50	2.67	16.94
			10.00	**3.00**	**15.00**

A Material of Little or No Feeding Value.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
1877-19	Fortney & Pulley Central City.	Cleaning wheat middlings, ground wheat screenings 4%, ground delinted cotton seed hulls, 25%, palm oil	
1877-19	Wilson & Son Russellville.	Same	
1545-19	Gray & Trent Irvington.	Cotton seed meal, linseed oil meal, cocoanut oil meal, brewers' grains, malt sprouts, ground and bolted grain screenings 30%, clipped oat by-product 10%, cocoa shell meal 10%, molasses, salt ¾%	Corn gluten feed present. No oil meal or malt sprouts found.
1733-19	Hurst & Co. Lexington.	Corn, alfalfa, molasses, clipped oat by-product 40%, salt 1%	
1580-19	Same	Molasses, (oat middlings, oat shorts and oat hulls) 35%, cracked corn, oats, barley, calcium carbonate ½%, salt ½%	
1581-19	Conner-Hayden & Co. Bardstown.	Molasses, cleaned and reground wheat screenings 25%, clipped oat by-products 10%, barley, cotton seed meal, corn feed meal, calcium carbonate ½%, salt ½%	
1581-19	Hurst & Co. Lexington.	Same	
1584-19	Same	Molasses, (oat middlings, oat shorts and oat hulls) 27%, barley, oats, cracked corn, old process linseed oil meal, salt 1%	
340-19	Mfrs. Warehouse	Wheat bran, corn bran, oats, screenings 20%, cob meal 20%	
340-19	J. W. Mahoney New Haven.	Same	
2480-20	R. J. Smith & Co. Somerset.	Ground corn, crushed oats, (oat middlings, oat shorts and oat hulls) 15%, salt ½%	Barley and wild oats present.
1723-19	J. V. Morrow Adairville.	Alfalfa meal, ground corn, crushed oats, cotton seed meal, molasses, (oat middlings, oat shorts and oat hulls) 10%, salt ½%	
1723-19	Rucker-Royalty Co. Lawrenceburg.	Same	Above guaranty in fiber.
1490-15	A. Schneider Sons Louisville.	Cotton seed meal, alfalfa meal, ground corn, molasses, (oat middlings, oat shorts and oat hulls) 42%	Above guaranty in fiber.
2579-17	Rucker-Royalty Co. Lawrenceburg.	Cotton seed meal, distillers' grains, corn distillers' solubles, corn gluten feed, linseed oil meal, hominy feed, corn feed meal, wheat middlings, wheat bran, (oat middlings, oat shorts and oat hulls) 12%, salt 1%	
883-17	N. D. Tabor Olive Hill.	Molasses, crushed oats, cracked corn, alfalfa meal, ground grain screenings 4%, cotton seed meal, (oat middlings, oat shorts and oat hulls) 20%	Barley present but not guaranteed. Above guaranty in fiber.

TABLE V.—MISCELLANEOUS MIXED FEEDS CONTAINING

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
840-19	Schumacher Feed	The Quaker Oats Co.	13.63	4.77	11.69
		Chicago, Ill.	10.00	3.25	11.00
840-20	Same	Same	12.25	3.09	10.09
			10.00	3.25	11.00
840-20	Same	Same	12.75	4.61	11.68
			10.00	3.25	11.00
840-20	Same	Same	12.38	3.92	11.85
			10.00	3.25	11.00
1233-19	Purina Pig Chow	Ralston Purina Co., Inc.	17.75	4.36	6.88
		St. Louis, Mo.	15.00	2.50	9.00
1398-20	Sweet Papa Horse and Mule Feed	Rex Mill & Feed Co.	11.38	2.74	16.30
		Nashville, Tenn.	9.00	2.00	15.00
1398-19	Same	Same	9.00	2.36	14.72
			9.00	2.00	12.00
1398-19	Same	Same	10.13	3.28	14.71
			9.00	2.00	12.00
1398-19	Same	Same	10.63	3.43	13.58
			9.00	2.00	12.00
107-19	King Dairy Feed	Same	14.75	2.40	23.65
			16.00	3.15	11.00
107-19	Same	Same	16.50	6.67	12.75
			16.00	3.15	11.00
107-19	Same	Same	13.38	4.09	17.26
			16.00	3.15	11.00
123-20	Old Maud Horse and Mule Feed	Royal Feed & Milling Co.	12.25	3.14	20.24
		Memphis, Tenn.	9.00	1.50	20.00
1787-19	Aunt Mandy Sweet Feed	Same	12.63	3.15	16.08
			9.00	1.50	20.00

A Material of Little or No Feeding Value.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
840-19	The O. H. Stumbo Co. .. Prestonburg.	Ground corn, hominy feed, yellow hominy feed, linseed meal, ground barley, rye flour, wheat middlings, cotton seed meal, (oat middlings, oat shorts and oat hulls) 27½%, ground puffed rice, ground puffed wheat, calcium phosphate 1½%, salt ½%	Above guaranty in fiber. No puffed wheat or puffed rice present.
840-20	The Rucker-Royalty Co.. Lawrenceburg.	Ground corn, ground milo maize, hominy feed, yellow hominy feed, linseed oil meal, ground barley, wheat bran, cotton seed meal, wheat middlings, (oat middlings, oat shorts and oat hulls) 27½%, ground puffed rice, ground puffed wheat, calcium phosphate 1½%, salt ½%	
840-20	Consolidated Grocery Co. Olive Hill.	Same	Above guaranty in fiber Excess of oat hulls present.
840-20	J. V. Morrow .... Adairville.	Same	Same.
1233-19	J. B. Blanton & Co. .... Frankfort.	Hominy feed, cane molasses, ground barley, gluten feed from corn, cracked corn, digester tankage, old process linseed oil meal, alfalfa meal, charred peat 5%, salt 1%	No ground barley present.
1398-20	Geo. W. Shadoin .... Hopkinsville.	Cracked corn, oats, alfalfa meal, (oat middlings, oat shorts and oat hulls) 10%, salt 1%	Above guaranty in fiber.
1398-19	R. L. Hardy .... Russellville.	Same	Same.
1398-19	Nicholson & Co. .... Williamsburg.	Same	Oats and alfalfa meal poor grade. No oat middlings and oat shorts present. Contains peanut hulls and a large percent of weed seed. Above guaranty in fiber.
1398-19	W. T. Renfrow .... Franklin.	Same	Above guaranty in fiber. Contains brown corn and weed seeds in addition to guaranteed ingredients. Grain used is damaged and inferior.
107-19	K. C. Mason .... Adairville.	Velvet bean feed (velvet bean meal and hulls) 10%, alfalfa, molasses, salt, corn, cotton seed meal, brewers' grains	Below guaranty in protein and above in fiber.
107-19	W. T. Renfrow .... Franklin.	Same	No velvet bean product present. Contains rice. Above guaranty in fiber.
107-19	Geo. W. Shadoin .... Hopkinsville.	Same	Below guaranty in protein and above in fiber. Inferior feed to guarantee.
123-20	H. P. Hawkins & Sons . Paducah.	Corn, alfalfa meal, clipped oat byproduct 20%, clover meal, cotton seed meal, cotton seed hulls 10%, molasses, salt 1%	
1787-19	J. J. Shaver .... Mayfield.	Corn, oats, alfalfa meal, clipped oat byproduct 20%, flax plant 10%, cotton seed meal, cotton seed hulls 15%, wheat bran, rice bran, salt 1%	

Table V.—Miscellaneous Mixed Feeds Containing

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
121-19	Sunrise Stock Feed	Royal Feed and Milling Co.	11.13	2.67	13.63
		Memphis, Tenn.	9.00	1.50	20.00
3054-18	Butter Queen Dairy Feed	Same	19.50	3.55	28.10
			16.50	3.50	30.00
130-19	Eureka Hog Feed	Same	12.13	4.13	14.07
			15.00	4.00	12.00
1784-19	Eureka Sweet Hog and Dairy Feed	Same	16.75	5.34	12.39
			16.00	4.00	18.00
2091-19	Simmons Seventeen Dairy Feed	The Simmons Milling Co.	16.00	3.69	14.38
		Cincinnati, Ohio.	17.00	4.00	13.00
2091-19	Same	Same	16.75	3.84	14.36
			17.00	4.00	13.00
2833-18	"Better Results" Feed	Sonora Milling Co.	13.38	3.13	7.00
		Sonora, Ky.	11.00	3.90	8.40
496-19	Same	Same	13.63	3.73	7.18
			11.25	3.90	8.40
161-20	Eagle Horse and Mule Feed	Southern Seed Co.	8.75	2.14	22.54
		Louisville, Ky.	9.00	2.00	20.00
161-20	Same	Same	11.38	2.84	18.52
			9.00	2.00	20.00
492-20	Econo Horse and Mule Feed	Same	10.00	3.17	17.25
			9.00	2.50	20.00
160-20	Eagle Dairy Feed	Same	16.50	3.05	20.30
			12.00	2.00	25.00
160-20	Same	Same	15.50	2.71	24.84
			12.00	2.00	25.00
159-19	Econo Dairy Feed	Same	19.00	3.60	23.75
			16.00	3.00	20.00
159-20	Same	Same	18.25	3.07	23.76
			16.00	3.00	20.00
159-20	Same	Same	21.00	2.56	25.08
			16.00	3.00	20.00
159-20	Same	Same	18.56	3.05	20.15
			16.00	3.00	20.00
159-20	Economy Dairy Feed	Same	17.50	4.25	23.01
			16.00	3.00	20.00
553-19	Economy Hog Feed	Same	11.25	3.63	12.70
			12.00	3.00	12.00
553-20	Economy Hog Feed	Southern Seed Co.	13.75	4.97	11.31
		Louisville, Ky	12.00	3.00	12.00

A Material of Little or No Feeding Value.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
121-19	F. D. Gaddie Clinton.	Corn, alfalfa meal, clipped oat by-product 20%, clover meal, cotton seed meal, cotton seed hulls 10%, oats, molasses, salt	
3054-18	Covington Bros. & Co. Murray.	Alfalfa meal, cotton seed meal, cotton seed hulls 35%, salt	
130-19	G. F. Phillips Paducah.	Unbolted corn meal, cotton seed meal, wheat shorts, rice polish, rice bran, peanut feed (peanut meal and hulls) 10%, cocoanut meal, velvet bean feed (velvet bean meal and hulls) 20%	Below guaranty in protein and above in fiber. Inferior to guaranty.
1784-19	Covington Bros. & Co. Murray.	Same	
2091-19	M. D. Royse Winchester.	Corn gluten feed, ground oat feed (oat middlings, oat shorts and oat hulls) 30%, wheat bran, cotton seed meal, velvet bean feed (velvet bean pods) 17%, wheat middlings, salt	Below guaranty in protein and above in fiber.
2091-19	Garrard Lincoln Produce Co., Lancaster.	Same	Above guaranty in fiber. Large percentage of oat hulls present.
2833-18	C. L. Jewell Horse Cave.	Ground corn, ground corn cob 10%, ground shucks 3%, wheat bran, ground wheat screenings 10%,	
496-19	Mfrs. Warehouse	Ground corn, ground cob 10%, wheat bran, ground wheat screenings 10%	
161-20	J. W. Vaughn Salt Lick.	Corn, oats, alfalfa meal, cotton seed hulls 10%, flax plant by-product 5%, clipped oat by-product 10%, molasses, salt ½%	No clipped oat by-product or flax plant by-product identified. Above guaranty in fiber.
161-20	Flavo Mill & Grain Co. Somerset.	Same	
492-20	Sam Terry Big Clifty.	Corn, oats, alfalfa meal, cotton seed hulls 10%, flax plant by-product 10%, clipped oat by-product 5%, molasses, salt ½%	Below guaranty in fat.
160-20	R. Lowry Leitchfield.	Cotton seed meal, alfalfa meal, cotton seed hulls 20%, flax plant by-product 5%, clipped oat by-product 10%, brewers grains, molasses, salt ½%	
160-20	J. W. Vaughn Salt Lick.	Same	
159-19	M. C. Marion Elizabethtown.	Cotton seed meal, alfalfa meal, cotton seed hulls 10%, flax plant by-product 10%, clipped oat by-product 5%, brewers' grains, molasses, salt	Above guaranty in fiber.
159-20	W. A. Mason Mt. Sterling.	Same	Same.
159-20	London Grocery Co. London.	Same	Same.
159-20	W. A. Burkhart Vine Grove.	Same	
159-20	Flavo Mill & Grain Co. Somerset.	Same	Above guaranty in fiber.
553-19	S. S. Cundiff Somerset.	Velvet bean feed (velvet bean meal and hulls) 25%, corn feed meal, ground wheat screenings 50%, alfalfa meal, wheat middlings, molasses, salt ½%	Same.
553-20	R. Lowry Leitchfield.	Velvet bean feed, (velvet bean meal and hulls) 25%, corn feed meal. ground wheat, screenings 50%, alfalfa meal, wheat middlings, molasses, salt ½%	

TABLE V.—MISCELLANEOUS MIXED FEEDS CONTAINING

Reg. No.	NAME OF FEED	MANUFACTURER	Analysis		
			Prot.	Fat	Fiber
2599-20	Ideal Horse and Mule Feed......	The Sugarine Co.	9.88	2.65	13.43
		Owensboro, Ky.	**9.00**	**2.50**	**12.00**
2599-20	Same	Same	10.38	2.79	12.55
			9.00	**2.50**	**12.00**
2599-20	Same	Same	9.38	2.65	14.65
			9.00	**2.50**	**12.00**
2017-19	Sugarine Horse and Mule Feed..	The Sugarine Co.	8.75	3.10	13.57
		Owensboro, Ky.	**9.00**	**2.50**	**12.00**
2013-19	Sugarine Dairy Feed	Same	17.13	3.20	11.98
			16.50	**3.50**	**14.00**
2013-19	Same	Same	18.50	4.78	10.95
			16.50	**3.50**	**14.00**
2013-20	Same	Same	19.25	4.70	11.21
			16.50	**3.50**	**14.00**
2013-20	Same	Same	17.50	4.72	9.90
			16.50	**3.50**	**13.00**
2013-20	Same	Same	18.63	3.86	11.63
			16.50	**3.50**	**13.00**
2013-20	Same	Same	16.75	2.74	11.07
			16.50	**3.50**	**13.00**
2013-20	Same	Same	16.38	3.69	11.32
			16.50	**3.50**	**13.00**
2235-20	Ideal Sugared Feed	Same	14.25	2.88	12.59
			12.00	**2.50**	**14.00**
1421-20	Velvet Molasses Feed	Sutherland Flour Mills Co. .	9.50	2.70	13.75
		Cairo, Ill.	**9.00**	**2.00**	**12.00**
1985-20	Fourex Dairy Ration	The Ubiko Milling Co.	23.50	4.90	13.22
		Cincinnati, Ohio.	**20.00**	**4.00**	**12.00**
2367-20	Big Value Horse Feed	Jno. Wade & Sons	9.10	3.05	11.42
		Memphis, Tenn.	**9.00**	**1.50**	**20.00**
1892-19	Hammond Dairy Feed	Western Grain Products Co..	17.00	4.78	13.42
		Hammond, Ind.	**16.50**	**3.50**	**14.00**
1892-20	Same	Same	17.50	4.95	14.40
			16.50	**3.50**	**14.00**
1892-20	Same	Same	18.13	3.79	13.45
			16.50	**3.50**	**14.00**

A Material of Little or No Feeding Value.

Reg. No.	SAMPLE TAKEN FROM	INGREDIENTS GUARANTEED	REMARKS—VARIANCE FROM GUARANTY
2599-20	Kentucky River Coal & Feed Co., Irvine.	Corn, oats, barley, molasses, (oat middlings, oat shorts and oat hulls) 20%, alfalfa meal, salt ½%	(Oat middlings, oat shorts and oat hulls) is largely oat hulls. Above guaranty in fiber.
2599-20	Jellico Grocery Co. ..... Corbin.	Same	Above guaranty in fiber.
2599-20	Anderson Feed & Seed Store, Lawrenceburg.	Same	Same.
2017-19	C. C. Hoskins .... London.	Molasses, corn, oats, (oat shorts, oat middlings and oat hulls) 30%, barley salt ½%	Above guaranty in fiber.
2013-19	Same	Molasses, ground and bolted wheat screenings 25%, clipped oat by-products 20%, corn feed meal, ground barley, cotton seed meal, cocoanut meal, calcium carbonate ½%, salt ½%	
2013-19	The Mahan Co. .... Whitesburg.	Same	
2013-20	Mitchell & Kenny ...... Danville.	Same	Small amount of weed seeds present.
2013-20	Riverside Co. .... Beattyville.	Wheat bran, prime cotton seed meal, cocoanut meal, ground and bolted grain screenings 25%, clipped oat by-product 20%, corn feed meal, molasses, calcium carbonate ½%, salt ½%	
2013-20	Anderson Feed & Seed Co., Lawrenceburg.	Same	
2013-20	R. B. Hayes & Co. ...... Hodgenville.	Same	Below guaranty in fat.
2013-20	Eliza Trimble .... Paintsville.	Same	Screenings used contain weed seeds.
2235-20	Rice Grocery Co. .... Hopkinsville.	Molasses, ground and bolted grain screenings 20%, clipped oat by-product 25%, cotton seed meal, cocoanut meal, calcium carbonate ½%, salt ½%	Wild buckwheat and pigeon grass present.
1421-20	Sutherland Flour Mills Co., Cairo, Ill.	Cracked corn, alfalfa meal, ground grain screenings 10%, (oat middlings, oat shorts and oat hulls) 10%, oats, molasses	Above guaranty in fiber.
1985-20	J. C. Everett & Co. ..... Maysville.	Cotton seed meal, O. P. linseed meal, hominy meal, wheat bran and middlings, gluten feed, reground oat feed (oat middlings, oat shorts and oat hulls) 10%, rye middlings, malt sprouts, salt	Above guaranty in fiber.
2367-20	McKeel & Thormond ... Murray.	Corn, oats, alfalfa meal, molasses, cotton seed meal, clipped oat by-product 20%	Small amount of buckwheat, barley and weed seeds present.
1892-19	J. C. Everett & Co. ..... Maysville.	Molasses, cotton seed meal, ground and bolted wheat screenings 25%, ground and bolted barley screenings 12%, clipped oat by-product 15%, salt ½%	Weed seeds present.
1892-20	C. T. Ashley & Co. ..... Nicholasville.	Same	Same.
1892-20	Same	Same	Linseed meal and weed seeds present.

Kentucky
Agricultural Experiment Station

UNIVERSITY OF KENTUCKY

Lexington, Ky.

BULLETIN NO. 236

(Research Bulletin)

A Comparison of the Calcium Content of Some Virgin and Cultivated Soils of Kentucky by an Improved Method for the Estimation of This Element.

By O. M. SHEDD

October, 1921

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*Assigned by U. S. Dept. of Agriculture.

BULLETIN NO. 236

A Comparison of the Calcium Content of Some Virgin and Cultivated Soils of Kentucky by an Improved Method for the Estimation of This Element.

By O. M. SHEDD*

HISTORICAL

The benefits derived from the liming of soils have been so pronounced that this custom has been followed from the earliest periods of agriculture. The practis originated as did many others thru observation and experience and affords one explanation at least for the popular adage that "a limestone country is a rich country." The inference is that any soil underlaid by limestone and derived from that material is usually more productive than is one formed, for instance, from sandstone. This is undoubtedly true as proved by the crops produced and the general prosperity of the two regions.

The literature on the subject of calcium in soils and the functions of its compounds is quite voluminous; in fact so large that it is desirable to mention only a few references that pertain to certain phases of this investigation. From an agricultural standpoint Wheeler (3) has given a concise enumeration of the good and bad effects of liming soils including among the benefits that it supplies an essential element of plant food.

Duggar (4) states that calcium has functions to perform which are strictly physiological, that is, directly important in the metabolism of the plant. As illustrations, he mentions that there is generally a considerable accumulation of calcium compounds in the leaf and on this account it has been assumed to be associated with chlorophyll formation. Experiments have established some definite relation existing between calcium content and starch digestion. Some investigators regard calcium as important in the neutralization of oxalic acid and acid oxalates assumed to be a factor in protein synthesis. Again, some relation exists between adequate calcium supply and cell wall formation. Finally, it might be mentioned that in the plant as well as in the soil, calcium is assumed to be important in preventing the injurious effects of an excess of magnesium.

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* The writer desires to thank Dr. A. M. Peter, Head of the Department of Chemistry, for helpful suggestions offered during the progress of the work; also the County Agents and others who assisted in the collection of the soil samples.

The application of lime and limestone to our soils for better crop production has been so beneficial that there is an increasing inquiry as to the probable need of these materials on areas in different sections of our state. The chief reason for their use has been to overcome an apparent acid condition of the soil, which is most easily done by the use of some base, such as quicklime, air-slaked or hydrated lime, limestone or dolomite. In this connection it might be of interest to mention that comparatively few of our soils contain any carbonate or show an alkaline reaction to litmus paper even when located in the limestone regions with vast amounts of the rock beneath.

Very little significance has been attached to the fact that in adding lime or limestone to soils for correcting acidity, an essential element for plant growth is being applied and one which is removed in comparatively large quantities by crops; hence any material of this nature is commonly classed as a "soil amendment," rather than as plant food. The reason of this is, it is assumed that soils generally contain abundant calcium compounds to furnish an ample supply of this element for all crop requirements. As soil-survey work has progressed, however, analyses show that there are certain types of soil in which the small percentage of total calcium found would indicate that there may be a deficiency of this element for permanent fertility. For example, Hopkins (8) from his work in Illinois concludes that the addition of limestone to those soils which contain less than 3,500 pounds of calcium per surface acre of 6 2/3 inches in depth, or 0.175 per cent, has a positive value for the calcium which it supplies as plant-food, in addition to any value it may have in correcting soil acidity or improving the physical condition. Van Slyke (13) states that certain of the essential elements are more extensively used by crops and sooner or later require special attention in the way of increasing the available supply in some soils. These elements, given in order of probable importance, are nitrogen, phosphorus, potassium and calcium. Among others who practically agree with the foregoing are Voorhees (14), Halligan (6), Thorne (12) and Frear (5).

In view of the fact that the Pennsylvania Experiment Station has carried on some of the oldest liming experiments in this country, the following extract taken from a letter received from Dr. Frear, Vice-Director of that institution, is significant: "In very many instances, more numerous than is commonly suspected, added lime has a direct nutritive value to plants cropped upon soils carrying either low amounts of lime or lime in compounds that are not readily dissociated by soil moisture, or both."

On account of the general belief that all soils contain ample calcium for plant growth, very little importance has been attached to a possible deficiency of this element. This assumption may have come about on account of calcium compounds being quite soluble; it was thought that even a limited supply would furnish the necessary amount for immediate needs of a crop.

EXPERIMENTAL

In view of the fact that large amounts of limestone are now being used on the soils of our state and the demand is increasing, the writer thought it would be of interest to study the calcium content of our virgin and cultivated soils in order to determine the effect of cultivation on this constituent.

As the work progressed, the data obtained on some soils indicated a possible deficiency of this element for crop production, therefore greenhouse experiments have been made in an effort to obtain, if possible, some information in this connection. The results obtained in the pot experiments will be published in another communication. They afford evidence that the supply of plant food calcium in the six different kinds of soil experimented upon is deficient.

One difficulty encountered at the beginning of this investigation was the estimation of total calcium in soils. As ordinarily carried on, it readily became apparent that the method at first employed which was the same as the one generally used for this determination was defective. So far as estimating the calcium in a solution of soil is concerned, it is the same procedure that had been adopted at the time as official by the Association of Official Agricultural Chemists. The chief difficulties encountered in its use were due to the passage thru the filter of iron and aluminum compounds either from hydrolyzation of ferric and aluminum phosphates in the ammonia precipitate or in a colloidal condition caused by washing with hot water, and to the occlusion of calcium, probably as the phosphate, in this precipitate. It was found impossible to avoid these errors if the washing with hot water was to be continued and this necessitated either some improvement or the substitution of another procedure that would be more satisfactory for this purpose. As a result the improved method was devised and found more rapid and accurate as shown in a former publication (11). After this work was published, the more important part of which was completed in 1916, there came to the writer's attention an improvement of the official method by the Association whereby hot ammonium nitrate solution is substituted for hot water in washing the ammonia precipitate (1).

In an effort to obtain further information concerning the relative solubility of the total calcium in the various types of soil employed in this work, it was thought that it might prove of interest to make some determinations of the more easily soluble portion. As this part will undoubtedly be more available for the growth of plants, the amounts obtained by two different procedures, on several samples, are included for comparison. It is believed, however, that the carbonated water extractions are more similar to soil conditions.

The methods employed for estimating the total and easily soluble calcium in soils follow:

TOTAL CALCIUM

Improved method: One gram of soil ground to pass a 100-mesh sieve was fused with 5 gm. of fusion mixture (10 parts Na_2CO_3+13 parts K_2CO_3) for 10 minutes, in a platinum crucible. The melt was dissolved in distilled water, HC1 added, the solution evaporated to dryness and the SiO_2 dehydrated by powdering the residue and drying on the water bath. After dehydration, HC1 and H_2O were added and the SiO_2 filtered and washed. The filtrate and washings should preferably not exceed 100 cc. Concentrated NH_4OH was carefully added until the solution was just alkaline to litmus paper, followed by HC1 until it was just acid. The ammonia precipitate was not entirely dissolved in every instance but frequently resembled a collodal ferric hydroxid solution when the precipitate was large. It was not thought necessary or even desirable to add HC1 until the solution was perfectly clear. The solution was then heated to boiling and 1 to 2 gm. of dry, powdered $(NH_4)_2C_2O_4H_2O$ cautiously added and the heating continued for 2 to 3 minutes. At this point the litmus paper often was blue, in which case HC1 was carefully added until the paper turned faintly but distinctly red, the container was put on the steam bath for a few hours, and allowed to stand over night at room temperature. The precipitate was filtered, passing the liquid thru the filter until clear and the container carefully washed twice with water, which was poured on the precipitate, and the latter was ignited to convert the calcium oxalate into oxid or carbonate. It was then transferred to the same precipitating container, dissolved in hot HC1, diluted with a small amount of water and heated, after which the manganese was precipitated by the addition of bromine water and a moderate excess of NH_4OH. The heating was continued until only a slight excess of NH_4OH remained, after which the solution was made slightly acid with $C_2H_4O_2$, filtered and the filter washed. This was done to remove manganese which was often present. The filtrate was made faintly alkaline with NH_4OH and then faintly acid with HC1, boiled and about 0.5 gm. $(NH_4)_2C_2O_4H_2O$, depending on the amount of calcium or the excess of

HCl present, was added as before, the heating continued for 2 to 3 minutes and the same procedure followed as in the first precipitation. After standing over night the precipitate was transferred to a filter, well washed, burned to constant weight and weighed as CaO.

By this method, it is possible for one person to average 6 determinations a day by working on 4 sets of 6 samples each at the same time. If found more convenient, the time allowed for the precipitation of the CaC_2O_4, may be shortened, as a few minutes' boiling and then allowing to stand for 5 or 6 hours on the steam bath will cause complete precipitation. However, it is preferable that the solution be cooled before the filtration is made.

EASILY SOLUBLE CALCIUM

Fifth normal nitric acid digestion. The air-dried soil, generally 120 gm. which had been ground to pass a 2 mm. sieve, was digested in the proportion of 1 gm. soil to 10 cc. of $0.2HNO_3$ for 5 hours at room temperature, shaking every 30 minutes. It was then filtered and an aliquot representing 100 gm. was evaporated to dryness. Concentrated HNO_3 was added to oxidize the organic matter, again evaporated and the last traces of HNO_3 eliminated by evaporation with HCl. The residue was dried on a steam bath to dehydrate SiO_2, taken up with HCl and H_2O, filtered and made to a definite volume. The calcium was then determined in an aliquot of from 2 to 10 gm., depending on the amount present, in the same manner as that used for the first precipitation of CaC_2O_4 by the improved method for total calcium except 0.5 to 1 gm. of $(NH_4)_2C_2O_4$, H_2O was used and only one precipitation made. Alter filtering and washing, the CaC_2O_4 was put into the precipitating container, dilute H_2SO_4 and H_2O added, heated and the calcium determined volumetrically with standard potassium permangate. In some determinations the results may be high, due to manganese oxalate occasionally contaminating the CaC_2O_4 when only one precipation of it is made. All the determinations of easily soluble calcium by this procedure reported herein were not made by the writer; some were taken from the soil reports of this Station. The method given is the one generally followed here and it was thought best to continue it inasmuch as the errors involved are not usually large except possibly on some soils which contain very little calcium and the results are intended only for general comparison.

Carbonated water digestion: The air-dried soil of the same degree of fineness as employed in the weak HNO_3 extraction was digested for 7 hours in a shaking machine, in the proportion of 1 gm. soil to 10 cc. of carbonated water (distilled H_2O saturated at room temperature with CO_2). The solution was afterwards filtered until clear, an aliquot representing 10 gm. was taken and the calcium determined in the same manner as in the improved method, a reprecipitation being made to eliminate the manganese.

The results by all methods were obtained gravimetrically except where noted. It is necessary that blanks be carried on in the same manner as the determinations, equal amounts of reagents and of water being used, for it has been found here that distilled water prepared from hard water in the ordinary laboratory still, may contain a small amount of calcium.

In the tables where the cultivated soils are compared with the corresponding virgin samples, the results are given in the same horizontal line. In computing averages, those determinations are not included where the data show that limestone has been added. It is assumed for purposes of comparison that the surface or first six inches of soil weighs 2,000,000 pounds and that the second six inches, designated in the tables as subsoil, weighs the same. The latter figures, therefore, are supposed to represent the second six inches altho the samples were generally taken from 6 to 18 inches in depth. The corresponding subsoils of the surface samples are indicated by the consecutive laboratory numbers. Duplicate determinations by the improved method are included as they were made during the work and none have been discarded.

For convenience, the soils have been arranged according to the geological areas and the results are given in the following tables:

Table 1—Pounds per acre of total and easily soluble calcium (Ca) in soils of the Eastern Coal Field area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
56447-9	Wolfe	8720	6280	880	3720	1380	120
56447	Wolfe	8580	....	....	3440	....	....
56461	Magoffin	....	....	....	3140	....	....
36552	Johnson	1860	1056	120	....	....	....
36552	Johnson	1140	....	....	....	....	....
36552	Johnson	720	....	....	....	....	....
56463	Johnson	....	....	....	2720	....	....
56463	Johnson	....	....	....	1580	....	....
56463	Johnson	....	....	....	1420	....	....
56465	Johnson	....	....	....	3720	....	....
56465	Johnson	....	....	....	2720	....	....
56589 a	Johnson	....	....	....	2140	....	280
56590 a	Johnson	....	....	....	1580	....	260
56591 a	Johnson	....	....	....	1420	....	None
17505	Floyd	....	....	....	140	714	....
17505	Floyd	....	....	....	720	....	....
56467	Floyd	6280	....	....	....	....	....
56467	Floyd	5860	....	....	....	....	....
56572 c	Floyd	....	....	....	6280	....	380
56573	Floyd	....	....	....	2280	....	140
56575	Floyd	....	....	....	2000	....	20
56576 b	Floyd	....	....	....	6720	....	620
56585	Floyd	....	....	....	1420	....	560
36538-9	Perry	9440	7280	620	5580	3860	460
56469-71	Lawrence	4580	....	360	2140	....	None
56481-3	Pike	8140	....	....	3720	....	....
56481-3	Pike	7720	....	....	3720	....	....
25787	Clay	....	....	....	1720	956	....
36870	Estill	....	....	....	3140	....	....
25256	Whitley	....	....	....	2280	1914	....
56541 g	Whitley	....	....	....	4580	....	880
56546 e	Whitley	....	....	....	2580	....	180
56547 f	Whitley	....	....	....	5280	....	1240
56553 d	Whitley	....	....	....	3000	....	None

a—No limestone added. Alfalfa a failure.
b—Two tons limestone per acre added. Same farm as 56575.
c—Two tons limestone per acre added. In alfalfa. Same farm as 56573.
d—One ton limestone per acre added. Alfalfa was a failure.
e—Limestone added. Only a fair growth of alfalfa obtained.
f—Limestone added. Good growth of alfalfa.
g—Limestone added. In alfalfa.

Table 1—Continued.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
36509	McCreary	....	....	....	4440	3598	....
51433	Knox	....	....	....	1420	....	....
14401	Boyd	....	....	....	4440	1929	....
17517	Carter	....	....	....	580	886	....
17517	Carter	....	....	....	1860	....	....
17517	Carter	....	....	....	1580	....	....
25007	Jackson	....	....	....	420	928	....
25007	Jackson	....	....	....	1000	....	....
25093	Knott	....	....	....	14000	....	....
36048	Lee	....	....	....	2000	....	....
36447	Greenup	....	....	....	2140	1170	....
50254	Breathitt	....	....	....	3000	....	....
50596	Laurel	....	....	....	720	1000	....
56586	Laurel	....	....	....	3720	1260	320
56586	Laurel	....	....	....	3280	....	....
	*Average	6318	4872	495	2836	1633	216
		Virgin subsoil			Cultiv'd subsoil		
56448-50	Wolfe	5280	....	....	2140	....	....
56462	Magoffin	....	....	....	280	....	....
56462	Magoffin	....	....	....	1140	....	....
36553	Johnson	1280	514	....	....	....	....
56464	Johnson	....	....	....	3140	....	....
56466	Johnson	....	....	....	2860	....	....
56468 36540	Perry	4000	....	....	2580	1660	....
56470-72	Lawrence	1140	....	....	1140	....	....
56470-72	Lawrence	420	....	....	1720	....	....
65470	Lawrence	....	....	....	580	....	....
56482-4	Pike	2860	....	....	3280	....	....
25257	Whitley	....	....	....	720	800	....
25257	Whitley	....	....	....	860	....	....
51434	Knox	....	....	....	580	....	....
51434	Knox	....	....	....	1720	....	....
51434	Knox	....	....	....	1000	....	....
50597	Laurel	....	....	....	420	680	....
50597	Laurel	....	....	....	1580	....	....
50597	Laurel	....	....	....	860	....	....
	*Average	2840	....	....	1870	1047	....

*—In computing averages in Tables 1 to 11, those soils are not included where the data show limestone has been added.

Table 2—Pounds per acre of total and easily soluble calcium (Ca) in soils of the St. Louis-Chester area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
56451	Lyon	....	....	....	6280	....	....
56453	Metcalfe	....	....	....	4440	....	....
56489-90 a	Metcalfe	4140	2160	....	4140	? 1680	....
56455	Adair	4000	....	....	....	....	....
56455	Adair	3720	....	....	....	....	....
17570	Lincoln	9640	6220	....	....	....	....
56485-7	Warren	11440	....	1580	5580	....	160
17341	Christian	....	....	....	2280	960	....
36580	Christian	....	....	....	2580	1470	....
36132	Clinton	....	....	....	2280	1468	....
36919-20	Edmonson	1580	....	140	1140	....	160
36122	Crittenden	....	....	....	2580	....	....
36055	Hardin	....	....	....	2140	1356	....
56563 c	Hardin	....	....	....	5280	....	120
56578 b	Hardin	....	....	....	3280	....	720
56581	Hardin	....	....	....	2720	....	140
56587 e	Hardin	....	....	....	3140	1240	220
36407	Caldwell	....	....	....	2720	....	....
43472	Breckenridge	....	....	....	4140	1820	....
36816	Meade	....	....	....	3440	1700	....
36817 d	Meade	....	....	....	5720	4512	1060
51212	Larue	....	....	....	2580	....	....
17367	Todd	....	....	....	2000	1286	....
25016	Pulaski	....	....	....	1720	1072	....
25999	Simpson	....	....	....	1000	870	....
25999	Simpson	....	....	....	1420	....	....
14739	Trigg	....	....	....	5000	2180	....
43625 e	Logan	....	....	....	4000	2100	....
56580	Taylor	....	....	....	2420	....	....
56588	Taylor	....	....	....	3580	2040	480
36418	Wayne	....	....	....	3000	1460	....
	Average	6630	6220	860	3181	1502	286
		Virgin subsoil			Cultiv'd subsoil		
56452	Lyon	....	....	....	5580	....	....
56454	Metcalfe	....	....	....	1860	....	....
56486-8	Warren	13140	....	....	3860	....	....
56486-8	Warren	11580	....	....	3860	....	....
43626	Logan	....	....	....	3860	1980	....
	Average	12360	....	....	3790	....	....

a—In first 18 inches.
b—Taken in 1918 from same field as 36055 in 1910 but in the meantime fertilizers were applied.
c—Another field which has been manured and fertilizers added. Same farm as 56578.
d—Limestone added. Same farm as 36816.
e—Fertilizers added.

Table 3—Pounds per acre of total and easily soluble calcium (Ca) in soils in the Cincinnatian area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
25002-4	Henry	4860	2542	320	4860	1556	260
25004	Henry	4000	....	....	....	....	....
9768-9	Washington	15440	13440	1500	29160	28680	3500
9768-9	Washington	15300	....	....	30000	....	....
9770	Washington	....	....	....	2860	2160	....
9770	Washington	....	....	....	3580	....	....
9771	Washington	....	....	....	4280	1880	....
9771	Washington	....	....	....	4140	....	....
2304	Mason	....	....	....	6440	....	....
2305	Mason	....	....	....	7580	7460	....
2306	Mason	....	....	....	7440	5140	....
56527	Mason	....	....	....	4860	3740	....
25278	Fleming	....	....	....	2860	1542	140
43726	Franklin	....	....	....	2580	1240	180
25549	Carroll	....	....	....	2140	972	240
25549	Carroll	....	....	....	2860	....	....
36507	Boone	....	....	....	3720	1558	....
25599 a	Pendleton	....	....	....	9860	7668	560
36198 a	Pendleton	....	....	....	11000	9510	980
50904	Pendleton	....	....	....	1000	940	280
50904	Pendleton	....	....	....	1860	....	....
36128	Spencer	....	....	....	4140	2122	....
56566 c	Spencer	....	....	....	11300	....	400
56567 d	Spencer	....	....	....	59880	....	3240
56568 e	Spencer	....	....	....	20000	....	1880
56577 b	Spencer	....	....	....	27580	....	3140
36788	Kenton	....	....	....	4140	2584	....
56595 f	Kenton	....	....	....	8720	....	520
56596 g	Kenton	....	....	....	18720	....	1280
56597 h	Kenton	....	....	....	5580	....	260
56598 g	Kenton	....	....	....	19300	....	1700

a—Good alfalfa soil.
b—No limestone added, but present. In sweet clover.
c—Limestone added, in alfalfa.
d—Limestone added, in sweet clover.
e—Limestone added, good growth of alfalfa.
f—No limestone added, poor growth of alfalfa. Taken from same field as 56596.
g—No limestone added, good growth of alfalfa.
h—No limestone added, poor growth of alfalfa. Taken from same field as 56598.

Table 3—Continued.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
43474	Owen	....	....	....	5140	....	....
51125	Scott	....	....	....	3000	....	240
25261	Anderson	....	....	....	7580	4956	....
25325	Cumberland	....	....	....	2860	....	480
25664	Bracken	....	....	....	6440	5770	....
36625	Harrison	....	....	....	3580	2684	....
36800	Garrard	....	....	....	4000	2314	....
36820	Grant	....	....	....	4140	2284	....
43009	Gallatin	....	....	....	5140	....	....
17502 i	Nicholas	....	....	....	5440	2714	480
17503 a	Nicholas	....	....	....	11440	7040	1080
25421	Montgomery	....	....	....	4580	3242	....
25798	Mercer	....	....	....	6580	3442	....
50672 51362	Shelby	4140	2580	140	2420	2180	160
	Average	7980	6187	653	7296	4438	860
		Virgin subsoil			Cultiv'd subsoil		
25279	Fleming	....	....	....	2000	1612	....
43727	Franklin	....	....	....	1580	1240	....
25600	Pendleton	....	....	....	14580	....	....
36129	Spencer	....	....	....	3000	....	....
36789	Kenton	....	....	....	4000	2100	....
51126	Scott	....	....	....	2420	....	....
51363	Shelby	2280	1120	....	....	....	....
	Average	....	....	....	4597	1651	....

i—Poor alfalfa soil. Taken from same farm as 17503.
a—Good alfalfa soil.

Table 4—Pounds per acre of total and easily soluble calcium (Ca) in soils of the Western Coal Field area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
36021-3	Webster	12860	7520	1180	11140	6160	610
56497-9	Henderson	7000	4220	520	4440	1500	180
56497	Henderson	....	....	....	4860	....	....
56517-9	Muhlenberg	5440	1180	20	5000	840	60
56554 a	Muhlenberg	....	....	....	3140	....	100
56574 b	Muhlenberg	....	....	....	19580	....	3600
17749	Hopkins	....	....	....	3580	1670	....
36691	Hopkins	....	....	....	3440	1642	....
17122	Union	....	....	....	3140	844	....
56564 c	Union	....	....	....	9860	....	560
56565 d	Union	....	....	....	9720	....	680
56582 b	Union	....	....	....	5440	....	....
25814	McLean	....	....	....	2000	1684	....
36452	Butler	....	....	....	1860	....	....
36193	Ohio	....	....	....	2280	514	40
56542 f	Ohio	....	....	....	3280	....	20
56543 g	Ohio	....	....	....	11300	....	2800
56544 h	Ohio	....	....	....	3440	....	200
56545 c	Ohio	....	....	....	7860	....	1220
56569 e	Ohio	....	....	....	2580	....	....
	Average	8433	4307	573	5409	1857	674
		Virgin subsoil			Cultiv'd subsoil		
36022-4	Webster	11440	7160	....	9000	5960	....
56498-500	Henderson	3580	....	....	4280	....	....
56518-20	Muhlenberg	2140	820	....	3000	880	....
17750	Hopkins	....	....	....	3280	1370	....
25815	McLean	....	....	....	2580	1598	....
	Average	5720	3990	....	4428	2452	....

a—Limestone added, light stand of sweet clover.
b—No limestone added but present, in sweet clover.
c—Limestone added. Good growth of alfalfa on this field.
d—No limestone added. Only fair growth of alfalfa. Taken from same farm as No. 56564.
e—From same farm as No. 36193 which was taken in 1911.
f—No limestone added. Poor growth of sweet clover.
g—Limestone added. Good growth of sweet clover.
h—No limestone added. Poor growth alfalfa.

Table 5—Pounds per acre of total and easily soluble calcium (Ca) in soils of the Keokuk-Waverly area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
25457	Adair	2000	770	220	....	....	....
56456	Adair	....	....	....	3000	....	....
56477-9	Adair	2280	....	....	4280	....	....
56477	Adair	2000	....	....	....	....	....
36242-63	Rockcastle	1140	600	20	3440	880	60
36263	Rockcastle	1420	....	....	....	....	....
56457-9	Green	5860	....	220	4720	....	400
36819	Barren	....	....	....	2140	884	....
56529	Barren	....	....	....	1280	....	220
25828	Casey	....	....	....	3000	1956	....
17901	Taylor	....	....	....	1720	486	240
25064	Allen	....	....	....	3280	2142	....
50644-6	Monroe	5860	4680	760	2140a	1660	400
25281	Hart	....	....	....	580	872	160
25281	Hart	....	....	....	1860	....	....
25281	Hart	....	....	....	1580	....	....
25666	Russell	....	....	....	860	1128	80
25666	Russell	....	....	....	1140	....	....
56579	Russell	....	....	....	2280	....	....
56584	Russell	....	....	....	2720	1160	380
	Average	3428	2017	305	2596	1241	243
		Virgin subsoil			Cultiv'd subsoil		
25458	Adair	2280	1042	....	....	....	....
56478-80	Adair	1000	....	....	3860	....	....
36243-64	Rockcastle	1140	680	....	1860	536	....
36264	Rockcastle	580	....	....	....	....	....
36264	Rockcastle	720	....	....	....	....	....
56458-60	Green	2860	....	....	4280	....	....
56458-60	Green	3000	....	....	4440	....	....
17902	Taylor	....	....	....	1580	414	....
25065	Allen	....	....	....	3140	1742	....
50645	Monroe	....	....	....	4000	1740	....
	Average	1756	861	....	3133	1108	....

a—Fertilizers used.

Table 6—Pounds per acre of total and easily soluble calcium (Ca) in soils of the Quaternary area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
56473-5	Graves	8280	....	140	4860	....	200
56557	Graves	....	....	....	6580	....	600
56521-3	McCracken	4580	....	....	5140	1636	....
56592	McCracken	....	....	....	4440	1600	240
56592	McCracken	....	....	....	4440	....	....
25361	Ballard	....	....	....	7720	400	760
25361	Ballard	....	....	....	7280	....	....
25382	Marshall	....	....	....	3280	1600	140
17120	Hickman	....	....	....	5860	1714	320
56549 a	Hickman	....	....	....	7000	1560	200
56550 b	Hickman	....	....	....	7720	....	1040
56551 c	Hickman	....	....	....	9720	....	560
56552 c	Hickman	....	....	....	11000	....	620
25771-2	Fulton	8140	5140	1020	3720	1342	220
36583	Calloway	....	....	....	2860	1600	140
	Average	7000	....	580	5997	1432	364
		Virgin subsoil			Cultiv'd subsoil		
56474-6	Graves	2580	....	....	2720	....	....
56522-4	McCracken	4000	....	....	3000	1284	....
	Average	3290	....	....	2860	....	....

a—No limestone added. Alfalfa grows only fairly well.
b—Limestone added. Alfalfa was a failure.
c—No limestone added. Alfalfa grows well.

Table 7—Pounds per acre of total and easily soluble calcium (Ca) in soils of the Trenton area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
14610-48	Clark	9440	7020	780	16300	10000	560
14613	Clark	....	....	....	28020	12440	....
17483-5	Fayette	7440	3598	....	8140	4642	....
17483	Fayette	....	....	....	8580	....	....
36957	Fayette	....	....	....	4140	3440	....
43407-8	Fayette	6140	5160	560	6140	4420	380
50737	Fayette	5140	3120	220	....	....	....
56536 b	Fayette	....	....	....	8440	....	620
56537 b	Fayette	....	....	....	8720	....	640
56538	Fayette	....	....	....	7140	....	....
56539	Fayette	....	....	....	7720	....	....
56540	Fayette	....	....	....	12000	....	....
56599 a	Fayette	....	....	....	33580	....	2480
56600 a	Fayette	....	....	....	14860	....	420
56601 a	Fayette	....	....	....	16580	....	500
56602 a	Fayette	....	....	....	20160	....	....
14604-6	Woodford	25000	12500	540	9440	4640	360
14604	Woodford	25860	....	....	....	....	....
56533 a	Woodford	....	....	....	30440	....	1600
56534 a	Woodford	....	....	....	45740	32040	1380
56535 a	Woodford	....	....	....	8140	....	920
56513-15	Madison	10580	....	....	3580	....	....
17810-11	Boyle	6860	4126	380	4860	2956	300
43566	Jessamine	....	....	....	5280	4160	....
36798	Bourbon	....	....	....	4580	4098	....
	Average	10147	5921	496	8981	5644	477
		Virgin subsoil			Cultiv'd subsoil		
14611-49	Clark	5860	3780	....	16300	12300	....
14614	Clark	....	....	....	22000	11300	....
50738	Fayette	5440	2880	....	....	....	....
14605-7	Woodford	24160	10640	....	11140	5440	....
14607	Woodford	....	....	....	12720	....	....
56514-16	Madison	4720	....	....	3280	....	....
56514	Madison	5860	....	....	....	....	....
43567	Jessamine	....	....	....	5440	3800	....
	Average	10188	5767	....	11790	8210	....

a—Limestone added. All in alfalfa except 56602. Nos. 56599-56602 were taken from Station Farm.

b—No limestone added. In alfalfa from 1906-1918. Nos. 56536-56540 were taken from Station Farm.

Table 8—Pounds per acre of total and easily soluble calcium (Ca) in soils of River Alluvial area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
25796-7	Daviess	7000	3712	600	7280	3284	460
36694-6	Daviess	5720	2820	360	5000	1720	240
36695	Daviess	....	....	....	4580	....	....
36792-6	Jefferson	3580	1898	100	3000	942	80
36796	Jefferson	....	....	....	3000	....	....
56501-3	Henderson	14580	9420	480	13440	7540	280
25692	Livingston	....	....	....	2860	1356	140
50123	Hancock	....	....	....	12440	11080	....
	Average	7720	4463	385	6943	4320	240
		Virgin subsoil			Cultiv'd subsoil		
36793-7	Jefferson	2140	842	....	2000	942	....
36793	Jefferson	2860	....	....	....	....	....
56502-4	Henderson	14860	....	....	14720	....	....
50124	Hancock	....	....	....	7860	8260	....
	Average	8680	....	....	8193	4601	....

Table 9—Pounds per acre of total and easily soluble calcium (Ca) in soils of the Devonian area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
14411-2	Clark	13140	9140	480	9440	6720	220
25662-3	Marion	2860	814	140	4000	1670	340
25662	Marion	....	....	....	3860	....	....
56509-11	Madison	3000	....	....	2580	....	....
14976	Bath	....	....	....	420	760	120
14976	Bath	....	....	....	1000	....	....
56558	Bath	....	....	....	2280	....	100
56559	Bath	....	....	....	2000	....	....
56560	Bath	....	....	....	2280	....	....
56561	Bath	....	....	....	2280	....	....
56583	Bath	....	....	....	4280	1080	700
56583	Bath	....	....	....	4140	....	....
56583	Bath	....	....	....	5000	....	....
17899	Bullitt	....	....	....	2280	720	....
36493	Nelson	....	....	....	1140	756	240
56570 a	Bullitt	....	....	....	2860	....	....
36578	Powell	....	....	....	720	928	80
36578	Powell	....	....	....	1580	....	....
56555	Powell	....	....	....	1860	....	20
56556	Powell	....	....	....	1580	....	None
50787	Rowan	....	....	....	580	580	180
50787	Rowan	....	....	....	1580	....	....
56562	Rowan	....	....	....	3440	....	1080
	Average	6333	4977	310	2668	1652	280
		Virgin subsoil			Cultiv'd subsoil		
56510-12	Madison	1140	....	....	1280	....	....
56510-12	Madison	....	....	....	580	....	....
	Average	....	....	....	930	....	....

a—From same field as 36493 collected in 1912 but fertilizers had been applied in the meantime.

Table 10—Pounds per acre of total and easily soluble calcium (Ca) in soils of the Silurian area.

Soil No.	County	Virgin surface soil			Cultivated surface soil		
		Total calcium	Easily soluble calcium		Total calcium	Easily soluble calcium	
			0.2 N HNO_3	Carbonated water		0.2 N HNO_3	Carbonated water
56493-5	Jefferson	8000	5420	680	4140	1700	120
56493	Jefferson	6720	....	....	....	....	....
56505-7	Madison	3000	....	....	2280	....	....
56505-7	Madison	3280	....	....	1140	....	....
25318	Trimble	....	....	....	4860	2200	....
50902	Oldham	....	....	....	4440	1600	300
25262	Lewis	....	....	....	1000	1400	220
25262	Lewis	....	....	....	1860	....	....
56571 a	Bullitt	....	....	....	3440	....	480
	Average	4547	....	....	3337	1725	280
		Virgin subsoil			Cultiv'd subsoil		
56494-6	Jefferson	4280	....	....	3280	....	....
56494-6	Jefferson	3440	....	....	4440	....	....
56506-8	Madison	860	....	....	720	....	....
56506-8	Madison	1280	....	....	580	....	....
	Average	2465	....	....	2255	....	....

a—Doubtful as to type.

Table 11—Average number of pounds per acre of total and easily soluble calcium (Ca) in the cultivated surface soils of the different geological areas.

Area (1)	Total Ca.	0.2N.-HNO_3 soluble Ca.	Per cent of total Ca(2) soluble in 0.2N.-HNO_3	Carbonated water soluble Ca.	Per cent of total Ca(2), soluble in carbonated water.
Trenton	8981	5644	58.4	477	5.3
Cincinnatian	7296	4438	72.2	860	9.2
River alluvial	6943	4320	58.9	240	3.8
Quaternary	5997	1432	28.8	364	6.0
Western Coal Field	5409	1857	42.2	674	9.1
Silurian	3337	1725	47.8	280	8.6
St. Louis-Chester	3181	1502	51.9	286	8.1
Eastern Coal Field	2836	1633	63.5	216	8.0
Devonian	2668	1652	54.6	280	9.9
Keokuk-Waverly	2596	1241	53.7	243	10.6

(1) Arranged according to decreasing amounts of total calcium found in Tables 1-11.

(2) In calculating these percentages, only the corresponding totals of those soils were used in which either the nitric acid or carbonated water digestion was made.

Table 12—Pounds per acre of total nitrogen, phosphorus and calcium in some surface soils included in Tables 1-11 which are comparatively low in all three constituents.

Soil No.	Area	County	Nitrogen (a)	Phosphorus (a)	Calcium
50904	Cincinnatian	Pendleton	2120	1300	1430
25262	Silurian	Lewis	2840	1084	1430
25999	St. Louis-Chester	Simpson	1320	588	1210
36919	St. Louis-Chester	Edmonson	1680	492	1140
17505	Eastern coal field	Floyd	800	812 (b)	430
17517	Eastern coal field	Carter	1280	812 (b)	1340
25007	Eastern coal field	Jackson	2220	480 (b)	710
50596	Eastern coal field	Laurel	2300	820	720
51433	Eastern coal field	Knox	2160	680	1420
14976	Devonian	Bath	3520	1076 (b)	710
36493	Devonian	Nelson	1860	874	1140
36578	Devonian	Powell	2680	710	1150
50787	Devonian	Rowan	1320	890	1080
25281	Keokuk-Waverly	Hart	1400	604	1340
25666	Keokuk-Waverly	Russell	1340	360	1000
		Average	1923	772	1083

(a) Taken from the soil reports of this Station.

(b) Strong hydrochloric acid (Sp. Gr. 1.115) digestion for 10 hours at 100 degrees C. The other phosphorus determinations were made by the magnesium nitrate method.

GENERAL DISCUSSION

The improved method has given more reliable results in this investigation and has several advantages over the official procedure. It is more rapid, the calcium precipitates are free from impurities and less difficulty in obtaining duplicates is encountered. It has a further advantage in that the handling of the ammonia precipitate, which is always more or less troublesome and which introduces errors in separations of this character, is avoided. This was found to be true as a result of a comparison made on over a hundred samples by both methods. The results obtained by the official procedure are not given here but many of them are included in the earlier publication (11).

It should be borne in mind that any method for the estimation of total calcium in soils has its limitations when applied to samples that are comparatively low in this element, for a variation of one-tenth of a milligram in the weight of CaO obtained on a one-gram sample is equivalent to 0.007 per cent of the element or 140 pounds per acre of surface soil. Consequently a variation of a few tenths of a milligram in duplicating, which is probably the best that can be expected on such samples, in work of this character, amounts to considerable on soils which contain only a few hundredths per cent of this element. Disagreement of duplicates in such a case, therefore, cannot be attributed altogether either to the method or to the individual but, even if the duplicates do not agree closely, they undoubtedly show that the soil is low in this constituent.

The geological areas in Tables 1 to 11 are consecutively arranged according to size; the Eastern Coal Field area comprises 10,000 square miles, the other areas 8,000, 7,900, 4,500, 4,400, 2,460, 1,200, 1,048, 900 and 875 square miles, respectively. (7)

From an examination of the tables, it will be observed that there has usually been a loss of calcium due to cultivation; moreover, some of our cultivated soils are very low in this element and sometimes this holds true for the corresponding virgin sample. In fact from work done at this Station on a number of these samples and given in Table 12, the calcium deficiency in some assumes equal importance with their low phosphorus and even low nitrogen content. These facts have to be taken into consideration in making these and similar soils more productive for it should be borne in mind that such crops as corn, oats and wheat remove nearly as much calcium as phosphorus from the soil while tobacco and some legumes take out considerably more calcium than phosphorus. In this connection it might be of interest to mention that analyses made by the writer (9) (10) on many of the soils used in this work and other representative samples, show that the soils of the better agricultural areas of our state usually contain the largest amounts of sulfur, phosphorus, manganese and calcium and those of the poorer areas, the least amounts of these elements. This was found to be generally true regardless of the fact that fertilizers are rather extensively used on the latter soils, for instance, those in the Keokuk-Waverly area.

As to the easily soluble calcium, most of the soils worked upon were the cultivated surface samples and the averages of the different areas are included in Table 11. It will be seen that with the exception of two areas, namely, the Quaternary and Western Coal Field, which show lower figures, from about 48 to 72 per cent of the total calcium is soluble in the weak nitric acid digestion. The most productive areas show the largest amounts and this is partly accounted for by the presence of considerable calcium phosphate in the soil of these regions, this material being soluble in the weak acid. The carbonated water digestions were more variable and show from 3.8 to 10.6 per cent of the total calcium soluble by this method. It is of interest to observe regarding the percentage solubility of the total as shown in Table 11 that two of the good areas, namely, the Trenton and River Alluvial, which have some of the largest percentages of calcium soluble in the weak acid, show the lowest in carbonated water. Another area, the Western Coal Field, which had a relatively low percentage solubility in the weak acid, shows among the highest in carbonated water. Again, the Quaternary, which has a rather high total, shows the lowest percentage of the same soluble in weak acid and the percentage soluble in carbonated water is comparatively low.

With but few exceptions, all the extractions with carbonated water in this work showed calcium in solution. This was largely in the form of bicarbonate for all solutions were alkaline and were titrated with standard acid. Usually the titrations did not agree with the gravimetric determinations and were both higher and lower, showing that other bases sometimes were present and that in some cases all the calcium was not in the form of bicarbonate. It should be borne in mind that while fewer determinations were made with carbonated water, nevertheless the averages found are comparable.

Referring to Table 11, it is apparent that soils which yield about one-tenth of their relatively small calcium content to carbonated water as did those from the Devonian and Keokuk-Waverly areas will become depleted of their calcium as a result of cultivation and leaching much sooner than the soils of the Trenton and River Alluvial which yield only about one-twentieth or less of their relatively large calcium content under the same conditions. Obviously, the latter soils which are found in our good areas are capable of maintaining their supply of plant-food calcium for crops much longer and much more effectively than are those from the poorer areas mentioned.

Two tons of good limestone contain about 1,560 pounds of calcium while the same amount of high-grade rock phosphate carries somewhat less. In Table 12, it will be found that of the fifteen soils taken from as many different counties and representing six soil areas, each contains less calcium than is found in two tons of good limestone and four of them contain less than is in one ton of this material. Bearing in mind that only a part of the calcium in these soils is easily soluble, the inference is obvious that an ordinary application of limestone to such soils of low calcium content may be beneficial because it supplies needed plant-food calcium as well as by performing other good functions such as correcting acidity. The results obtained here suggest plainly that some of our soils at least are not capable of supplying adequate plant-food calcium for maximum crops for an indefinite period.

SUMMARY

1. The procedure which has often been used for the determination of calcium in a soil solution does not give reliable results. The principal difficulties encountered in its use are mentioned.

2. An improved method that avoids the handling of the ammonia precipitate thereby eliminating the chief source of error in the official procedure has been tried and found to be more accurate and rapid.

3. The total calcium of a large number of Kentucky soils, both virgin and cultivated, has been determined and it appears in nearly every instance that cultivation has caused a considerable loss of this element.

4. From this and previous investigations which have included several hundred samples taken from nearly all the counties in this state, it has been found that the best types of soil usually contain the largest amounts of calcium, phosphorus, sulfur and manganese and the poorest have the lowest.

5. The easily soluble calcium, that is the portion soluble in weak nitric acid (0.2N) and in carbonated water has also been determined in many samples. Some distinctive differences were found in the relative solubility of this element in the soils from different areas.

6. Many soils were found to be so low in calcium that their deficiency in this constituent requires consideration as well as their low phosphorus and nitrogen supply.

7. The application of one or two tons of limestone or of rock phosphate per acre to some soils adds about as much calcium as the surface soil contains. If these materials are found to be beneficial on such soils, the question arises, what part of such benefits can be attributed to the plant-food calcium which these materials supply apart from other useful functions which they perform?

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Kentucky
Agricultural Experiment Station

UNIVERSITY OF KENTUCKY

Lexington, Ky.

BULLETIN NO. 237

(RESEARCH BULLETIN)

THE REMOVAL OF MINERAL PLANT-FOOD BY NATURAL DRAINAGE WATERS.

By

J. S. McHARGUE and A. M. PETER

Lexington, Kentucky
November, 1921

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BULLETIN NO. 237

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THE REMOVAL OF MINERAL PLANT-FOOD BY NATURAL DRAINAGE WATERS.

By

J. S. McHARGUE and A. M. PETER

The removal of mineral nutrients by natural drainage waters is a problem in agriculture to which the farmer has given little attention. He is not usually aware of the loss incurred thru this agency or considers the subject as something beyond his means of control. When his soils become exhausted of their fertility he usually assumes that the greater part of the nutrients has been removed in the crops that have been grown. However, if all the sources of loss of nutrients from the soil could be definitely accounted for, it is probable that the portion removed permanently by crops, in any system of farming, would be found to be very small in comparison with the amount lost thru drainage waters. Evidence pointing to this fact can be obtained in a review of the literature on the subject of drainage waters.

At the Rothamstead Experiment Station[1], it has been shown repeatedly that greater quantities of the mineral nutrients are always leached from a bare soil by drainage waters than from a similar soil bearing a crop.

At the Cornell University Experiment Station, Lyon and Bizzell[2] have shown by means of lysimeter experiments extending over a period of five years that much larger quantities of calcium, magnesium, sulfur, sodium and nitrogen are removed by drainage water percolating thru a bare soil than were removed in the crops grown on equal areas of the same kind of soil. Potassium was the only element, except nitrogen, which was removed in greater quantities in crops than in the drainage water. On the other hand, more sulfur was removed in the drainage water from a bare soil than the total amount contained in the crop and in the drainage water from a similar soil under a crop. They also state that the yearly average for nitrogen lost thru drainage water from bare soils was seventeen times greater than that from soils on which crops were grown. The experiments mentioned also show the folly of the practis sometimes permitted by farmers who, after having cultivated their land for several seasons in succession, are inclined to give the soil the "rest cure," the idea being that if the soil remains uncultivated and bare, except for the crop of weeds that may grow in the meantime, for a time equal to that in which it was under cultivation, its fertility will be improved rather than injured.

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[1] Hall, The Book of the Rothamstead Experiments, 1917.

[2] Lyon and Bizzell, Cornell University Experiment Station Memoir 12, June, 1918.

In this country it is a very common practis among farmers to allow a part, if not all, of the land on which corn has been grown to remain without a cover crop until the following spring, with the result that very serious losses of mineral nutrients occur, in the meantime, thru erosion and leaching by drainage waters.

The foregoing citations show in a general way the character of the results obtained by a large number of other investigators who have been interested in determining the loss of mineral nutrients in drainage waters in limited areas of soils.

If such large quantities of mineral nutrients are leached from small masses of soil by percolating waters, one may be inclined to wonder in regard to the quantity of mineral nutrients carried in solution in the water of springs and streams, which has past, at least in part, thru the soil or come in contact with it. While numerous chemical analyses are on record which show the principal mineral substances dissolved in the water of springs, brooks, lakes and rivers, practically all such analyses have been made for either sanitary or industrial purposes and, thus far, no survey has been made for the express purpose of showing the relative amounts of valuable fertilizing elements, phosphorus, potassium, nitrogen, calcium and others of less importance, which are being leached from the soil of different areas, under natural conditions, and carried away in solution in the natural drainage waters. Accordingly the present investigation was undertaken to throw more light on this very important subject. In the work undertaken it was proposed that determinations be made of the essential plant nutrients carried in solution in the waters of natural springs and streams, those taken in Kentucky being selected to represent some of the principal geological areas.

METHODS OF ANALYSIS.

More than fifty different samples of water from streams and springs in various parts of Kentucky and a few from points in other states have been analyzed for phosphorus, potassium, nitrate-nitrogen, calcium, magnesium, sulfur, sodium, chlorin and, in a few instances, manganese. Five gallons of the water as taken from the stream constituted a sample. After the sample was received at the labratory, twelve liters were filtered thru a Pasteur-Chamberland filter to remove any suspended matter, as only the amount of mineral constituents in solution was desired. Ten liters of the filtered water were transferred to a large aspirator bottle. The water was conducted by means of glass and rubber tubing from the lower aperture of the bottle to two four-liter porcelain evaporating dishes. The size of the streams discharging into the dishes and the height of the flames from the ring burners beneath them were so adjusted that the rate of the evaporation was equal to or a little ahead of the amount of water flowing into them. By means of this apparatus, ten liters of water could be evaporated within five hours and, when once adjusted, it required no further attention until the reservoir was empty and about two liters of water remained in the dishes. The ring burners were turned out at this stage of the evaporation and a second set of 4-inch Fletcher burners arranged beneath the dishes were lit and, with some care in adjusting the flames of these, the contents of the dishes were brought to dryness.

The residues in the dishes were dissolved in a small amount of dilute hydrochloric acid and the solutions and washings thus obtained were transferred to a 400-cc glass beaker and brought to dryness on the water-bath. The organic matter in the residue was destroyed by evaporating several times to dryness with strong nitric acid. The residue was then treated one or more times with hydrochloric acid and brought to dryness, taken up in dilute hydrochloric acid and the silica filtered out and washed with hot water. The filtrate from the silica was concentrated to a small volume and 1 cc of a solution of pure ferric chlorid added. The solution was then made alkaline with ammonia and the precipitate of ferric hydroxid containing phosphate filtered out and thoroly washed. Phosphorus was determined in the precipitate by the volumetric molybdate method. The filtrate from the ferric hydroxid precipitate was made acid and diluted to a definite volume from which an aliquot was taken for calcium and magnesium, and one for potassium, sodium and sulfur.

The alkalinity, chlorin and nitrate and nitrite determinations were made on other portions of the filtered water by the usual methods.

RESULTS OF THE ANALYSES.

The analyses and the different points at which samples of water were collected are given in the tables that follow. To get the figures for total mineral matter, in the last column, the sum of all the determinations except alkalinity was increased by the CO_2 equivalent of the alkalinity and the oxygen equivalent of the nitrate-nitrogen and diminished by the oxygen equivalent of the chlorin.

TABLE I.—Waters of the Ordovician Area (Mohawkian and Cincinnatian) in Parts Per Million of the Clear Water.

Number.	COUNTY	SOURCE.	Phosphorus pentoxid P_2O_5.	Potassium oxid. K_2O.	Calcium oxid. CaO	Magnesium oxid. MgO.	Sodium oxid. Na_2O.	Sulfur trioxid SO_3.	Nitrogen of nitrates N.	Chlorin Cl.	Alkalinity calculated as $CaCO_3$.	Free Ammonia.	Nitrite.	Total mineral matter.
1	Fayette	Tile drains, Nicholasville pike, Station farm	0.85	0.44	110.7	10.3	2.2	19.8	10.0	7.5	116.0	none	trace	240.0
2	Fayette	Tile drains south of dairy barn, Station farm	0.26	0.90	129.4	19.8	0.5	11.7	12.0	6.8	125.0	small	trace	269.2
3	Fayette	McConathy spring, Station farm	0.64	0.50	54.6	6.0	2.5	8.5	9.0	6.5	95.0	none	none	154.6
4	Fayette	University of Kentucky campus, spring below Maxwell spring	0.87	1.80	97.3	9.0	0.9	23.4	8.0	10.0	120.0	trace	trace	224.9
5	Fayette	Russell Cave spring at mouth of cave	0.63	0.70	80.8	5.9	2.3	11.5	7.0	6.8	127.5	none	trace	190.4
6	Fayette	Spring at Kingston stock farm	0.45	0.60	82.0	5.9	2.1	10.2	8.0	6.5	130.0	small	trace	193.6
7	Fayette	Spring on Nicholasville pike at junction of Higby Mill pike	0.91	1.13	45.0	5.0	1.9	7.8	3.5	3.5	115.1	....	....	128.7
8	Fayette	North Elkhorn Creek near the Russell Cave pike	0.50	1.50	77.3	7.5	2.4	13.1	4.0	6.0	130.0	small	trace	179.7
9	Fayette	Branch on J. P. Headley place, Russell Cave pike	0.63	1.05	98.6	7.2	3.0	21.6	8.0	9.0	137.5	small	small	230.7
10	Fayette	South Elkhorn Creek, on the Harrodsburg pike	0.35	1.71	52.4	3.0	1.5	2.9	5.4	4.0	140.0	....	....	147.6
11	Woodford	Lake on Big Sink pike, about 2 miles N. E. of Versailles	0.14	1.55	31.1	4.5	2.0	8.4	5.0	4.0	80.1	....	....	105.5
12	Woodford	Branch crossing Old Frankfort pike, ¾ miles E. of Wallace	0.64	0.94	37.7	1.9	1.4	6.6	6.0	3.5	95.1	....	....	117.1
13	Woodford	Spring on farm of Tavner Dunlap, Big Sink pike	0.68	0.71	39.2	4.7	0.3	5.8	3.6	2.0	100.1	....	....	111.0
14	Woodford	Spring on farm of William Steel, Frankfort pike	0.65	0.73	47.2	9.5	0.4	8.1	7.0	5.0	110.1	....	....	146.1
15	Woodford	Spring at phosphate mines, Wallace Station	0.49	1.25	42.4	8.8	1.5	7.0	5.6	4.0	110.0	....	....	134.2
16	Woodford	Branch on Versailles and Midway pike, ¼ mile S. of Old Frankfort pike	0.61	0.74	49.8	4.2	1.4	6.5	5.0	4.0	120.0	....	....	138.6
17	Woodford	Branch on Versailles and Midway pike about 2⅓ mi. N. Versailles	0.57	0.99	42.7	2.2	1.8	7.2	4.5	4.5	105.0	....	....	123.5
		Average	0.58	1.01	65.8	6.8	1.7	10.6	6.6	5.5	115.1	....	....	167.2

In Table 1 are given the analyses of seventeen samples of water, collected at as many different points in Fayette and Woodford Counties. Most of these waters flow from as productive soils as are to be found in the Bluegrass area. This fact is indicated by the amount of soluble phosphates and nitrates carried in solution in the waters from these counties. While the total phosphorus is small when compared with some of the other mineral constituents present, yet it is well known that under normal conditions very little phosphorus is lost from the soil thru drainage waters. When soluble phosphates come in contact with calcium carbonate or the hydrates of iron and aluminum, both of which are present in abundance in the soils and strata of the Bluegrass area, the phosphorus is precipitated and left in the soil. Nothwithstanding this fact it is to be noted that an appreciable amount of this valuable fertilizer is in solution in the drainage waters collected at different points in this area.

Another point of interest in connection with the analyses in this table is the high average obtained for nitrate nitrogen in the drainage waters of this area. Undoubtedly this represents the greatest economic loss from the standpoint of plant nutrients that occurs in the soils in the Bluegrass region. However, in spite of the fact that great quantities of nitrogen are washed from the soils of this section, yet the process of nitrification is so active that a sufficient amount of nitrate nitrogen is usually present in the soils of this area to make it unprofitable to apply a nitrogenous fertilizer. Soil phosphorus apparently performs a two-fold function. First it serves as a plant nutrient for crops and secondly as an essential element in the process of nitrification, since it has been shown that in the absence of phosphorus no nitrification can take place.[3] This fact apparently is confirmed further by the results obtained in this investigation, for it will be seen that the average amount of mineral constituents contained in the waters in Table II is greater than that contained in the waters of Table I, yet the phosphorus and nitrate nitrogen in the waters in Table II are approximately one-third of that found in the waters of Table I.

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[3] Warington, J., Chem. Soc. (London), Vol. 45, p. 641, 1884.

The ratio existing between soluble phosphorus and nitrate nitrogen in the drainage waters from the phosphatic area represented by Fayette and Woodford counties suggests the idea that a high phosphorus content in the soil is necessary for maximum nitrification, otherwise we would expect as much nitrate nitrogen to occur in the analyses of the drainage waters contained in Table II, which show even a greater amount of every mineral reported in Table I except phosphorus and nitrogen.

The averages of soil analyses made in this department[4] show that the soil of the most phosphatic area (Trenton, part of the Ordovician) contains most nitrogen. This difference has been maintained during the many years of our observation and seems to be characteristic. Considering this observation in connection with that of the higher nitrate content of the waters from this area, it appears that the supply of nitrogen is maintained better in the phosphatic soils than in those that are less phosphatic. The further inference is suggested that nitrogen fixation, possibly by the activity of non-symbiotic organisms in the soil, is most active in the highly phosphatic soils.

The average result for potassium indicates that no great amount of this element is being lost in the drainage waters of the Bluegrass area. That the amount of potassium contained in these waters is small is, in all probability, due to the great absorptive properties possessed by the soils of this area, which contain considerable clay and organic matter.

The average result for calcium shows that much of this element is being leached from the soils, and evidently, from the analyses, there is a greater loss of calcium in the waters from Fayette than in those collected from Woodford county. This is also true for sulfates but the nitrates are not quite as high in the waters collected in Woodford County as in the waters from Fayette County. There is a decided diminution in the alkalinity of the waters from Woodford County when compared with those from Fayette. This is also true for the total mineral matter contained in the waters from the two counties.

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[4] Kentucky Bulletin 193, p. 141, 1915.

The average of the total mineral matter contained in the waters of this area is rather high and shows that considerable quantities of valuable mineral nutrients are lost to the soils of the Bluegrass area in the drainage waters.

TABLE II.—Waters of the Mississippian Area in Parts Per Million of the Clear Water.

Number.	COUNTY	SOURCE.	Phosphorus pentoxid P_2O_5.	Potassium oxid. K_2O.	Calcium oxid. CaO	Magnesium oxid. MgO.	Sodium oxid. Na_2O.	Sulfur trioxid SO_3.	Nitrogen of nitrates N.	Chlorin Cl.	Alkalinity calculated as $CaCO_3$.	Free Ammonia.	Nitrite.	Total mineral matter.
18	Lyon	Spring at Eddyville	0.11	1.00	104.4	13.9	4.3	9.9	2.0	7.0	235.0	small	trace	150.7
19	Simpson	Spring, farm of J. W. McFarlin	0.05	1.05	57.5	8.7	2.3	8.1	2.4	4.0	170.2	....	....	165.0
20	Simpson	Drake's Creek*	0.45	1.49	38.2	8.9	2.3	9.4	1.4	6.0	120.1	....	....	123.7
21	Hart	Green River at Munfordville**	0.17	1.90	68.5	18.8	1.7	6.5	trace	4.0	140.0	small	trace	154.2
		Average	0.20	1.36	67.2	12.6	2.7	8.5	1.9	5.3	166.3	....	....	177.1

*The drainage basin of Drake's Creek is wholly in the Mississippian area.

**The drainage basin of Green River above Munfordville lies in Hart, Taylor, Green, Metcalfe, Adair, Russell and Casey counties. It is almost entirely Mississippian.

The analyses contained in Table II represent waters collected from the Mississippian formation, an area the soils and rock strata of which contain much less phosphorus than is found in the soils and rocks of the Bluegrass (Ordovician) area. This fact is very strikingly brought out in the analyses of the waters contained in this table, the averages for phosphorus and nitrogen being approximately one-third of those found in the analyses of the waters contained in Table I. From the average for the total mineral matter it is to be observed that the waters represented in Table II contain considerably more mineral matter in solution than the waters in Table I. The greatest variation is in the results for magnesium oxid, which is practically twice the amount found in the waters of the Bluegrass area. This is as it should be since it is well known to those who have some knowledge concerning the geology of the two different formations that the rocks of the Mississippian area contain very much more magnesium than the rocks in the Ordovician area. The great increase in the magnesium content and the relatively small increase in the calcium content in these waters over those reported in Table I probably is because magnesium carbonate dissolves more rapidly than does calcium carbonate from rocks containing considerable quantities of the two compounds.

TABLE III.—Waters of the Pennsylvanian Area in Parts Per Million of the Clear Water.

Number.	COUNTY	SOURCE.	Phosphorus pentoxid P_2O_5.	Potassium oxid. K_2O.	Calcium oxid. CaO	Magnesium oxid. MgO.	Sodium oxid. Na_2O.	Sulfur trioxid SO_3.	Nitrogen of nitrates N.	Chlorin Cl.	Alkalinity calculated as $CaCO_3$.	Free Ammonia.	Nitrite.	Total mineral matter.
22	Lee	Mountain spring at Heidelberg	0.15	2.06	7.3	6.1	1.3	20.4	0.4	10.0	20.0	....	....	55.4
23	Laurel	1 mile south of Boreing on Robinson Creek	0.03	2.29	5.1	1.9	3.5	1.1	1.3	5.0	25.0	....	....	33.9
24	Morgan	Licking River at West Liberty[1]	0.20	2.56	12.6	5.6	3.5	10.1	trace	5.0	35.0	small	trace	53.8
25	Pulaski	Cumberland River at Burnside[2]	0.17	1.46	11.6	3.4	2.5	6.9	trace	4.0	40.0	none	trace	46.7
26	Lee	Kentucky River at Heidelberg[3]	trace	3.20	11.2	6.3	4.1	6.0	trace	7.0	45.0	none	none	56.2
27	Laurel	Laurel River at Lily[4]	0.06	2.08	7.6	12.8	2.8	9.8	....	3.5	35.0	....	....	53.3
	State of Pennsylvania	Alleghany River at Pittsburg[5]	0.20	3.10	29.4	7.0	11.3	40.8	trace	18.3	30.0	none	trace	119.2
		Average	0.14	2.39	12.1	6.2	4.1	13.6	0.9	7.5	32.9	....	....	61.9

[1] The drainage basin of Licking River above West Liberty is in Morgan and Magoffin counties, Ky. It is entirely Pennsylvanian.

[2] The drainage basin of the Cumberland River above Burnside is mainly Pennsylvanian with some Mississippian.

[3] The drainage basin of the Kentucky above Heidelberg is practically all Pennsylvanian.

[4] The drainage basin of the Laurel River above Lily is entirely Pennsylvanian.

[5] The drainage basin is Pennsylvanian.

The analyses presented in Table III represent the mineral content of drainage waters collected from streams within the Pennsylvanian or Coal-measures formation. This formation lies in the eastern part of the state and covers about one-fourth of its total area. The rock strata of this area are made up of sandstones, shales, clays and coal. From a general knowledge of the composition of the rocks and soils of this area we would expect the drainage water flowing from them to be quite poor in mineral nutrients, when compared with the drainage waters from the limestone formations contained in Tables I and II. This assumption holds true for phosphorus, calcium, nitrates and alkalinity only. The quantities of the remaining elements reported in the table, potassium, magnesium, sodium, sulfur and chlorin, are, in most instances, greater than those found in the analyses contained in Tables I and II. The amount of potassium in the waters from the Coal-measures is more than twice that found in waters from either of the limestone formations. The soils of the latter contain considerably more total potassium than the sandy soils in the coal fields. The fact that potash is retained more tenaceously in the soils of the limestone areas can be attributed to differences in absorptive properties of the two soils. Soils resulting from the disintegration of limestones contain considerable clay and iron compounds and much more organic matter than do soils derived from the disintegration of sandstones. Also the percolation thru sandy soils is much greater and more rapid than in soils containing considerable clay.

Voelcker[5] has shown that clays and marls are more effective in retaining potassium than light loams or sands, and that the latter had but little absorptive power. This author also states that both humus and the zeolitic double silicates take part in the retention of potash salts. It thus appears that the soils in the limestone areas, altho containing more potash, lose it less rapidly than the more sandy soils of the Coal-measures. This condition may be accounted for by the fact that the former contain more clay and organic matter, which are important factors in absorption phenomena.

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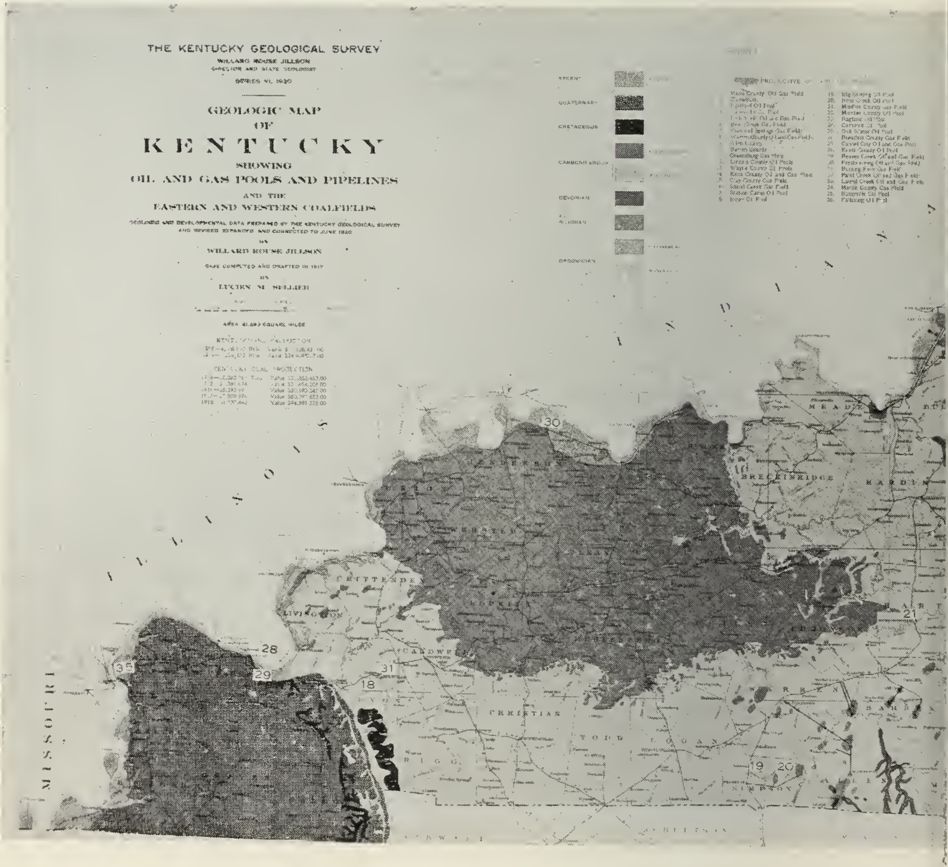
[5] Hall, The Soil, p. 217, 2nd edition, 1908.

Since the amount of calcium in the drainage waters of the Coal-measures is quite low it would be expected that magnesium would be correspondingly low, but the analyses show that the average for magnesium in these waters is nearly as great as that contained in the waters of the Bluegrass area. It is quite evident to one familiar with the composition of sand rocks that the magnesium is in some form other than the carbonate, probably the silicate, as the writer recalls that most sandstone rocks contain numerous small flakes of mica, which probably serve as the source of the magnesium and potassium in the waters from this area.

The averages for sodium oxid, sulfates and chlorin are greater than those found in the waters in Table I. The results for alkalinity are quite uniform and the average is about half of that found in limestone waters. The average for the total mineral constitutents contained in the water of the Coal-measures is approximately one-third that found in either Tables I or II.

Regardless of the fact that the drainage waters of the Coal-measures contain but little plant nutrients, one observes good crops produced on most of the soils of this area. The sandy soils of this area also appear to retain their moisture for a longer time than do the soils of the Bluegrass region. This is probably due to the latter having a much larger amount of clay substance in their make-up, which causes a greater amount of the surface water to run into natural drainage channels before absorption can take place.



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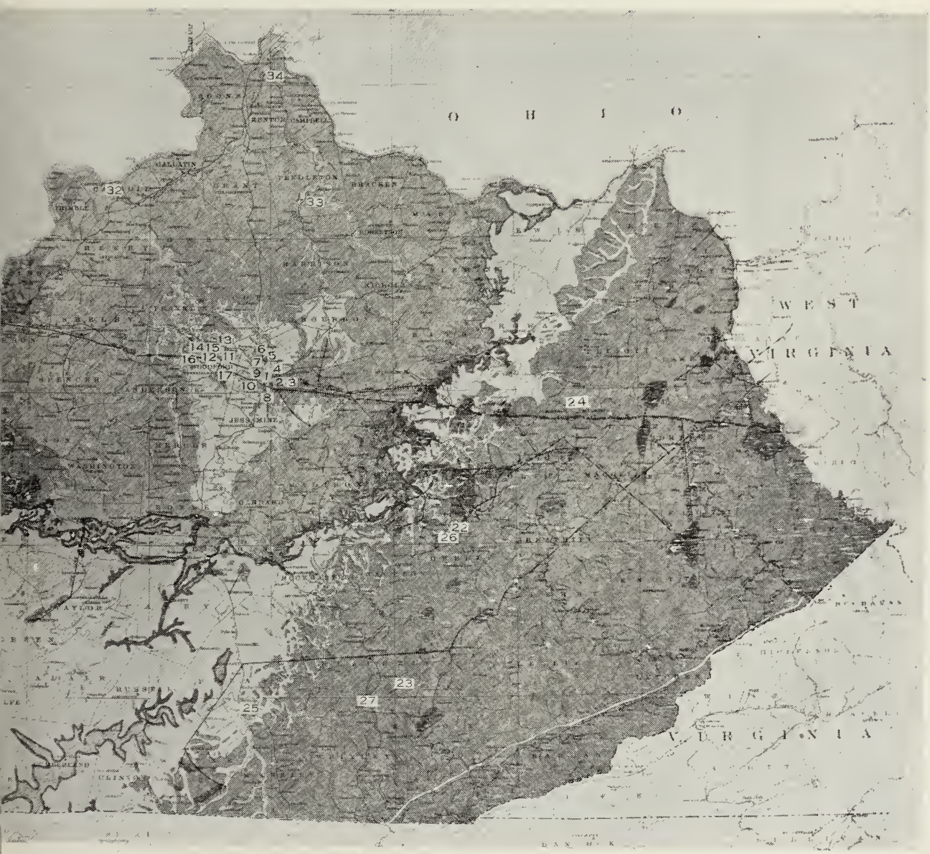

PONDING SAMPLES WERE OBTAINED.

TABLE IV.—Waters of Rivers Draining Very Large Areas of Varied Geology, in Parts Per Million of the Clear Water

Number.	STATE	SOURCE.	Phosphorus pentoxid P_2O_5.	Potassium oxid. K_2O.	Calcium oxid. CaO	Magnesium oxid. MgO.	Sodium oxid. Na_2O.	Sulfur trioxid SO_3.	Nitrogen of nitrates N.	Chlorin Cl.	Alkalinity calculated as $CaCO_3$.	Free Ammonia.	Nitrite.	Total mineral matter.
28	Kentucky	Ohio River at Paducah	0.17	2.00	29.5	11.4	5.1	23.3	0.1	10.0	85.0	small	trace	127.2
29	Kentucky	Tennessee River at Paducah	0.13	1.41	28.0	6.5	2.2	5.5	trace	5.5	75.0	none	trace	81.0
30	Kentucky	Green River at Birk City	0.27	7.16	53.1	9.4	2.9	6.8	0.4	6.5	135.0	small	trace	145.5
31	Kentucky	Cumberland River at Eddyville	0.24	2.20	45.9	3.5	3.0	7.5	trace	5.0	112.0	trace	trace	115.5
....	Nebraska	Missouri River at Omaha	0.15	3.38	43.9	16.3	30.5	16.1	....	125.0	170.0	....	....	282.1
....	S. Dakota	Missouri River at Pierre	0.12	6.86	75.0	13.1	57.8	142.7	trace	13.0	150.1	none	none	372.4
....	Minnesota	Mississippi River at Minneapolis	0.25	2.83	61.0	12.4	4.9	12.6	none	2.5	60.0	....	....	122.3
....	Louisiana	Mississippi River at Baton Rouge	0.15	2.52	39.6	11.0	1.5	21.3	0.8	12.5	80.0	small	trace	123.2
		Average	0.20	3.54	48.3	10.5	13.5	29.5	.4	22.5	108.4	....	....	172.2

The analyses presented in Table IV represent the mineral nutrients carried in solution by some of the larger rivers of the country. The results obtained for phosphorus in solution are quite uniform for all the streams represented. The average for phosphorus pentoxid is but one-third of that found in the small streams flowing from the highly phosphatic Bluegrass area. The amount of soluble phosphates added to these streams in sewage does not increase the soluble phosphorus content above that found in some small streams which are known to be free from such additions. It therefore appears that the phosphorus in solution in the larger streams remains a rather constant quantity.

The average for potassium oxid shows a decided increase over that found in small streams. This increase may be due in part to soluble potassium salts added in sewage, altho the Green and Missouri rivers show an unusually high potassium content before much sewage is added to their waters.

The calcium content and magnesium content of river waters do not show much variation and the average for calcium is considerably less than that found in small streams flowing from limestone formations, yet the average for magnesium in large streams is almost as great as that found in small streams flowing from magnesian limestone strata.

The Missouri River contains an unusually high amount of sodium compounds. There are also considerable increases in sulfates and chlorin in the larger streams. The normal chlorin content for unpolluted water is about 6 parts per million. The average of the large rivers amounts to almost four times the normal, thus indicating that much of the increase is due to sewage contamination. The Missouri River at Omaha has an abnormally high chlorin content, whereas, at Pierre, its sulfate content is abnormally large.

The nitrate nitrogen content in large streams is very small, compared with that in the small streams that flow from the Bluegrass area, suggesting that the drainage waters from large areas outside of this formation contain very much less nitrate nitrogen, tho nitrate may have been removed by the action of algae and bacteria. The average for total mineral matter in solution in large streams is about the same as that found in small streams.

In Table V are given analyses of waters collected from near the head and near the mouth of each of the larger rivers flowing thru, or bordering on Kentucky and receiving practically all the drainage water of this state. For the purpose of comparing the composition of the water near the head of the stream with that near its mouth, the analyses are arranged in pairs and each stream is discussed separately as follows:

TABLE V.—Waters of Large Rivers of the Mississippi System, Taken Near the Source and Near the Mouth... Parts Per Million.

Number	RIVER AND LOCATION	Phosphorus pentoxid P_2O_5.	Potassium oxid. K_2O.	Calcium oxid. CaO	Magnesium oxid. MgO.	Sodium oxid. Na_2O.	Sulfur trioxid SO_3.	Nitrogen of nitrates N.	Chlorin Cl.	Alkalinity calculated as $CaCO_3$.	Free Ammonia.	Nitrite.	Total mineral matter.
26	Kentucky River at Heidelberg, Ky., near head	Tr.	3.20	11.2	6.3	4.1	6.0	trace	7.0	45.0	none	none	56.0
32	Kentucky River at Worthville, Ky., near mouth	0.20	1.70	25.1	5.3	2.0	30.2	0.6	4.0	55.0	small	traces	94.1
24	Licking River at West Liberty, Ky.	0.20	2.56	12.6	5.6	3.5	10.1	trace	5.0	35.0	small	trace	53.8
33	Licking River, South Fork, at Falmouth	0.48	2.20	33.4	9.7	3.0	18.2	trace	5.0	70.0	none	trace	101.7
34	Licking River at mouth	0.23	1.90	33.5	8.5	4.0	23.0	1.0	4.5	90.0	trace	trace	118.1
29	Tennessee River at Paducah, Ky., near mouth	0.13	1.41	28.0	6.5	2.2	5.5	trace	5.5	75.0	none	trace	81.0
25	Cumberland River at Burnside, Ky.	0.17	1.46	11.6	3.4	2.5	6.9	trace	4.0	40.0	none	trace	46.7
31	Cumberland River at Eddyville, Ky.	0.24	2.20	45.9	3.5	3.0	7.5	trace	5.0	112.0	trace	trace	115.5
21	Green River at Munfordville, Ky.	0.17	1.99	68.5	18.8	1.7	6.5	trace	4.0	140.0	small	trace	162.3
30	Green River at Birk City, near mouth	0.27	7.16	53.1	9.4	2.9	6.8	0.4	6.5	135.0	small	trace	144.6
	Ohio River at Pittsburg, Pa., near head	0.20	3.10	29.4	7.0	11.3	40.8	0.2	18.3	30.0	none	trace	119.9
28	Ohio River at Paducah, Ky., near mouth	0.17	2.00	39.5	11.4	5.1	23.3	0.5	10.0	85.0	small	trace	128.6
	Missouri River at Ohaha, Nebr.	0.15	3.38	43.9	16.3	30.5	16.1	....	125.0	170.0	....	....	282.0
	Missouri River at Pierre, S. D.	0.12	6.86	75.0	13.1	57.8	142.7	trace	13.0	150.0	none	none	371.7
	Mississippi River at Minneapolis, Minnesota	0.25	2.83	61.0	12.4	4.9	12.6	none	2.5	60.0	....	....	122.3
	Mississippi River at Baton Rouge, Louisiana	0.15	2.52	39.6	11.0	1.5	21.3	0.8	12.5	80.0	small	trace	124.1
	Average	0.20	2.99	38.2	9.3	8.8	23.0	0.2	14.8	86.4	....	....	131.8

KENTUCKY RIVER.

The Kentucky River has its origin in the west side of the Cumberland Mountains in the southeastern part of the state, and receives the drainage waters from about one-half of the area of the eastern coal field. It flows northwest across the state and unites with the Ohio River at a point about midway between Cincinnati, Ohio, and Louisville, Kentucky. Its length is about 250 miles. In the first 90 miles of its course the drainage waters flow from the Coal-measures, the rocks of which consist largely of sandstones, interbedded with shales, clays and coal. A knowledge of the chemical composition of these various strata would suggest that the drainage water flowing from them would contain but little plant nutrients. The analysis of the water of the Kentucky River previous to flowing thru or receiving much drainage water from the limestone formation shows that but little phosphate and calcium are removed, whereas considerable potassium and magnesium salts are being carried away in solution.

After passing out of the Coal-measures formation the Kentucky River flows for more than two-thirds of the remaining distance of its course thru a deep channel cut in limestone strata. After flowing 160 miles thru limestone formations and receiving the drainage waters from large areas on either side, one would expect considerable changes in the composition of the mineral matter in water to have taken place. The analysis of a sample taken from the river a short distance above its mouth shows a decided increase in its phosphorus, calcium, sulfur and nitrogen content and a decrease in potassium, magnesium, sodium and chlorin when compared with the analysis of the water before entering the limestone formation. The analyses show an increase of 38.1 parts per million in mineral matter while flowing thru the intervening country and receiving drainage waters from either side between the two points on the river at which samples were taken. The increase of the phosphorus content from a trace of 0.2 part per million indicates that the drainage waters of the limestone areas are much richer in this element than those of the Coal-measures area.

Elkhorn Creek which receives the greater part of the drainage water from the highly phosphatic Trenton formation undoubtedly discharges a greater quantity of phosphorus in parts per million into the Kentucky River than any other tributary.

It is interesting to note that the amount of potassium contained in the drainage waters from the Coal-measures flowing into the Kentucky River is almost twice as great as that found in the analysis of the water at the mouth of the river. This fact shows that the sandstone areas are losing potash more rapidly than the limestone areas. The calcium content has more than doubled, while the magnesium content has diminished one part of MgO per million. The sodium oxid and the chlorin have diminished two and three points, respectively. The sulfur has increased more than fivefold. This large increase in sulfur probably is due to the oxidation of the pyrite contained in the limestone during the process of weathering and erosion, and to sulfates being added to the stream in sewage and from the air. The sandstones are quite free of pyrite and consequently the drainage water from them is low in sulfur. There is a notable increase in the nitrogen content of the water at the mouth of the river as compared with that found in the water near the head, which indicates a more active formation of nitrates in the limestone soils than occurs in soils formed from sandstones. The total amount of mineral matter carried in solution as shown in the analysis of the sample collected near the mouth has only increased 38.1 parts per million after passing thru 160 miles of limestone country.

LICKING RIVER.

The Licking River rises among the hills on the west side of Pine Mountain in Floyd County. After flowing in a northeasterly direction across the northeastern corner of the state for about 200 miles, it empties into the Ohio River at Newport, opposite Cincinnati, Ohio. Its head waters lie entirely in the Coal-measures and receive the drainage waters of Floyd, Magoffin and Morgan counties. About one-third the entire length of the river lies in the Coal-measures.

A sample of water for analysis was collected from this stream at West Liberty, a point on the river a short distance above where the stream flows from a sandstone formation into limestone formation.

The results obtained in the analysis agree very closely with those obtained for the head waters of the Kentucky River. The result for phosphorus shows a notable increase in the head waters of the Licking River over that found in the head waters of the Kentucky River. The sulfur content is also slightly higher in the Licking than in the Kentucky River.

A sample of water was collected from the river a short distance above its mouth. Comparing the results of the analyses of the samples collected near the head and near the mouth, it will be seen that there is only a very slight increase in the phosphorus content, a decrease in the potassium, approximately a threefold increase in calcium, a notable increase in magnesium, sodium, sulfur and nitrogen, and a slight decrease in chlorin.

The South Fork of the Licking River is about 60 miles in length and receives a part of its drainage water from the highly phosphatic Trenton formation in Bourbon County. A sample of water was collected from this stream a short distance above its junction with the main stream at Falmouth. The analysis shows a much higher mineral content than the head waters of the main stream. All the determinations, except sodium, sulfur and nitrogen, are higher than those found in the water at the mouth of the Licking River. The high result for phosphorus in the water of the South Fork is interesting and is due to the fact that this stream receives drainage water from the highly phosphatic Trenton formation in Bourbon and adjoining counties.

TENNESSEE RIVER.

The Tennessee River is the largest tributary to the Ohio River. It is about 1200 miles in length and receives its drainage waters from areas in Kentucky (on the southeast and west), Virginia, North Carolina, Alabama and Tennessee. Only a very small amount of drainage water from Kentucky flows into the Tennessee River either from the southeast part of the state or in the western part where it flows for a distance of 75 miles from the southern border across the state to unite with the Ohio River on the north.

A sample of water was collected from this stream a short distance above its mouth at Paducah. The analysis of the water gave results very similar to those found in the water at the mouth of the Kentucky River, with the exception that sulfates are very much lower in the Tennessee than in the Kentucky River.

CUMBERLAND RIVER.

The Cumberland River rises in the southwest side of the Cumberland Mountains and drains a considerable area of the Coal-measures lying in the southeastern part of the state. Its total length is about 600 miles. About one-third of its length lies in Kentucky.

A sample of water for analysis was collected from this stream at Burnside, Pulaski County. This point is a short distance above where the river passes from the Coal-measures into the St. Louis limestone formation. The results of the analysis will therefore represent the character of the mineral constituents contained in the drainage waters flowing from the southeastern portion of the Coal-measures.

The mineral constituents contained in the sample of water taken from the river at Burnside agree very closely with the results found in the headwaters of the Kentucky and Licking rivers.

After passing out of the Coal-measures formation the river flows over the St. Louis limestone formation the remainder of its course. The river flows across the Kentucky and Tennessee border line in Monroe County, Kentucky, and after traversing a very winding channel for a distance of about 400 miles in northern Tennessee, it again flows into Kentucky on the west in Trigg County and passes across the state to unite with the Ohio River at Smithland, a short distance above the mouth of the Tennessee River.

A sample of water for analysis was taken from the Cumberland river at Eddyville, Lyon County, a point on the river about 30 miles above its mouth.

Comparing the analysis of the head waters with that obtained at the mouth of the river, it is to be noted that there are only slight increases in phosphorus, potassium, sulfur and chlorin. There is a fourfold increase of the calcium. The magnesium and sodium remain almost constant. There is a gain of 68.8 parts per million of mineral matter between the two points on the river at which the samples were taken.

GREEN RIVER

The Green River rises in Lincoln County, flows northwest in a very irregular course and unites with the Ohio River at a point near Henderson, Ky., a distance of about 350 miles from its source. This river receives the greater part of its water from the St. Louis and the western coal field formations.

A sample of water representing the head waters of this stream was collected at Munfordville, Hart County, for analysis. All the drainage up to this point on the stream is from limestone areas. Soon after passing Munfordville the river enters and flows the remainder of its course thru the western coal field, an area the strata of which are made up of sandstones, shales and clays, interbedded with coal.

A second sample of water was collected from the river at Birk City in Daviess County, a point just beyond where the river emerges from the western coal field before entering the Ohio River.

Comparing the results of the two analyses we find no striking variations except in the potassium and magnesium determinations, which are significant because of their wide variations. The results for potassium are in reverse order with respect to the foregoing rivers discust, and this is as it should be for it will be recalled that the head waters of all the rivers previously mentioned in this paper have their origin in a sandstone formation, whereas the head waters of the Green River have their origin in a limestone formation. It will be observed that the result for potassium in the sample of water collected at Munfordville is identical with the result for potassium at the mouth of the Licking River, slightly greater than the result for potassium at the mouth of the Kentucky and a little less than the amount found at the mouth of the Cumberland river.

The amount of potassium found in the water at the mouth of the Green River is considerably more than twice as great as that found in the water of any river studied in this investigation. If the high result obtained in this case is normal for this stream it is to be concluded that the strata of the western coal field are losing their potassium more than twice as rapidly as the strata of the Eastern coal field. The magnesium content of the water of this stream at Munfordville is twice as great as the amount found in the river at its mouth. An examination of a geological map of Kentucky will show that practically all the drainage water entering the Green River above Munfordville drains from what is represented on the map as the Keokuk-Waverly formation, the strata of which include limestones high in magnesium. Hence the drainage waters in passing over and thru these strata become more nearly saturated with magnesium than waters draining from areas containing less of this element in their strata.

The total amount of mineral matter in solution at Munfordville is 162.3 parts per million, whereas the total amount of mineral matter in solution at the mouth of the stream is 144.6, a diminution of 17.7 parts per million, and this is as it should be since the river receives considerable drainage water thru small tributaries lying entirely within the area of the Western coal field, and since the strata of this area contain very small amounts of calcium, magnesium and sulfur, the water draining from this area would be low in the compounds of these elements and would tend to dilute a more concentrated water such as was found at Munfordville.

It will be seen from the results presented in Table V that those streams having their origin in the Coal-measures, the Kentucky, Licking and Cumberland Rivers, contain very much less mineral matter in their head waters than the Green River which has its origin in a limestone formation and that the mineral matter contained in the water near the mouths of the Kentucky, Licking and Cumberland rivers has increased as much as one hundred parts per million in flowing thru the distance between the two points at which the samples were taken

It is also to be noted that the Missouri river contains considerably more mineral matter in solution at the points where samples were obtained than any other stream represented in this table. This increased concentration in mineral matter over that found in streams flowing into the Mississippi from the east, is doubtless due to the more arid conditions that prevail in the country thru which the Missouri river flows.

MINERAL NUTRIENTS CONTAINED IN THE WATER FROM LARGE RIVERS.

Having determined the amount of the mineral nutrients that are contained in some of the springs, small streams and rivers that lie wholly or in part within the state, it was thought that analyses of samples of water collected from near the mouths of the Ohio and the Mississippi rivers would be of particular interest in this connection. Since the mean annual volume of each of these streams has been determined near their mouths by the U. S. Geological Survey, these data and the analyses of the waters afford a means for calculating the amount of the mineral constituents removed thru each of these streams in a year's time.

OHIO RIVER.

This river has a length of about 1000 miles and receives practically all the drainage water from six states, an area of about 228,000 square miles. The head waters of this river and of all its larger tributaries have their origin in the west side of the Appalachian Mountains.

A sample of water was collected from the Ohio river at Paducah, Ky., a short distance above where it flows into the Mississippi. The mean annual volume of the river, at its mouth is 204,000 cubic feet per second. From this volume and the analysis of the water, the results given in the following table have been calculated. In fixing values for the different elements, the present market prices for commercial fertilizers have been taken, namely, phosphorus at 20 cents per pound, nitrogen at 30 cents per pound, potassium at 30 cents per pound, calcium at .025 cent, magnesium at .025 cent and sulfur at 1 cent per pound.

The amount and value of the mineral nutrients in solution carried thru the mouth of the Ohio River in a year's time is based on the accompanying analysis.

TABLE VI.—Amount and Value of the Mineral Nutrients Carried in Solution by the Ohio River.

Element	Parts of Element Per Million	Pounds Per Second	Tons Per Year	Estimated Value
P	0.072	1.09	17,199	$6,879,600
N	0.50	7.57	119,446	71,667,600
K	1.66	25.13	396,521	237,912,744
Ca	28.27	427.93	6,752,222	54,017,775
Mg	6.81	103.26	1,629,319	8,146,594
S	9.32	141.29	2,229,544	44,590,889
Total	46.632	706.27	11,144,251	$423,215,058

From the above table it is to be observed that in round numbers 11,000,000 tons of the mineral nutrients, P, N, K, Ca, Mg and S are carried away in solution annually, the value of which is nearly four hundred and twenty-five million dollars.

MISSISSIPPI RIVER.

The Mississippi River has an approximate length of 2,550 miles and drains an area of 1,259,000 square miles. It receives practically all the drainage water from the states lying between the Appalachian and Rocky Mountain systems. The water of this river has been analyzed by a number of chemists. The earliest analysis on record dates back to 1884, and was made from a sample of water collected from the Mississippi river by Sidener,[6] at Brainard, Minn.

Clark[7] reports eight different analyses of the waters of the Mississippi river. Two of the more recent analyses are included in this paper for comparison with the results obtained by the writer on a sample of water taken from the Mississippi River at Baton Rouge, La., in the spring of 1915.

The analysis under the heading "New Orleans" represents the mean of 52 composite samples taken daily between April 29, 1905 and April 28, 1906, and was made by J. S. Porter. It

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[6] Sidener, 13th Ann. Rep. Geol. Nat. Hist. Survey, Minn., 1884, p. 102; Clark Bull. 491, U. S. Geol. Sur., p. 70.

[7] Clark, Data of Geochemistry, Bull. 491, U. S. Geol. Survey, p. 70.

TABLE VII.—Analyses of the Waters of the Mississippi River.

Elements in Parts Per Million	Location		
	New Orleans	Carrollton	Baton Rouge
P	....	0.09	.07
K	....	1.57	2.09
N	.58	....	.80
Ca	32.00	20.25	28.29
Mg	8.40	4.66	6.62
Na	13.00	6.86	5.87
S	7.99	5.57	8.52
Cl	9.70	11.05	12.50
Mn	....	.08	.11

is unfortunate that the elements phosphorus, potassium and manganese were not determined in these analyses.

The analysis under the heading "Carrollton" was made by C. H. Stone upon one sample of water collected from near the middle of the stream, at a depth of six feet below the surface, and was published in 1905.

The analysis under the head "Baton Rouge" was made by the writer on a sample of water collected in April, 1915, from near the middle of the stream and near the surface.

Comparing the results given in each of the analyses in Table VII, it will be observed that they agree more closely than might be expected. From the close agreement between the results obtained in these analyses it is to be concluded that the mineral constituents contained in the water of the lower Mississippi River are rather constant quantities and any calculations made from any one of the above analyses in regard to the total mineral substances in solution carried into the Gulf of Mexico in a year's time must be regarded as having considerable significance.

The mean annual volume of the Mississippi River near its mouth has been determined as being 664,000 cubic feet per second. From the mean annual volume and the analysis given in the fourth column of Table VII the weights and values have been computed for the mineral nutrients carried in solution by this river at its mouth in the periods of time indicated in the following table.

TABLE VIII.—Amount and Value of Mineral Nutrients Carried in Solution by the Mississippi River at Baton Rouge, Louisiana.

Element	Parts Per Million	Pounds Per Second	Tons Per Year	Estimated Value
P	.07	3.50	62,188	$24,875,200
N	.80	40.00	630,720	378,422,000
K	2.09	103.14	1,626,312	975,786,912
Ca	28.29	1,423.54	22,446,379	112,231,494
Mg	6.62	328.50	5,179,788	25,898,940
S	8.52	427.00	6,732,936	134,658,720
Total	66.39	2,325.68	36,678,323	$1,651,873,266

From the estimates given in Table VIII it is to be seen that more than one and a half billion dollars' worth of six essential elements for plant growth are carried out to sea in solution by the waters of the Mississippi River annually.

In addition to the amount of mineral nutrients in solution, this river carries in suspension according to Hilgard,[8] an annual deposit of 7,469,000,000 cubic feet of soil. From the analysis for phosphorus (.15 per cent) and potassium (1.70 per cent) contained in the sediment obtained from the sample of water collected from the river at Baton Rouge, the value of these two elements contained in one year's deposit of the sediment would amount to $3,208,682,400. This value, plus that carried in solution by the stream, gives a total loss of $4,618,088,779. of plant nutrients per annum. This value is considerably greater than the total value of the corn crop produced in the United States in 1917.

It is quite probable that if more attention was given to the growing of cover crops and other judicious methods of conserving the fertility of the soil, the amount of plant nutrients and soil carried out to sea annually by drainage waters could be greatly reduced.

CONCLUSIONS.

1. The amount of mineral nutrients contained in drainage waters varies with the nature of the strata from which they flow. The drainage water from limestone areas contains the greatest amount of mineral matter and that from sandstone

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[8] Hilgard, Soils, 1906, p. 7.

areas the least.

2. The drainage waters from sandstone areas contain more than twice as much potassium as the drainage waters from limestone areas.

3. The amount of phosphorus contained in drainage waters varies with the amount contained in the soils from which the water flows. The drainage waters from the highly phosphatic soils in the bluegrass area contain the greatest amount of phosphorus.

4. The greatest amount of nitrate nitrogen was found in drainage waters containing the greatest amount of soluble phosphorus, thus indicating a parallelism existing between soluble phosphorus and nitrate nitrogen.

5. High phosphorus content in soils accelerates the activity of nitrifying organisms.

6. Drainage waters from small streams and containing the greatest amount of nitrate nitrogen did not contain the greatest amounts of mineral matter.

7. The total mineral matter in solution in large streams is not much less than that contained in small streams flowing from limestone areas.

8. The value of the essential mineral nutrients carried into the Gulf of Mexico by the Mississippi River is estimated as being nearly four and one-half billions of dollars per annum.

9. More extensive growing of cover crops on soils that would otherwise remain bare will conserve much of the mineral nutrients carried in solution and in suspension by drainage waters.

ACKNOWLEDGEMENTS

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Agricultural Experiment Station
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Analyses of Commercial Fertilizers

BY
H. E. CURTIS, H. R. ALLEN
and R. H. RIDGELL

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BULLETIN NO. 238

ANALYSES OF COMMERCIAL FERTILIZERS

By H. E. Curtis, H. R. Allen and R. H. Ridgell

This Bulletin gives the results of analyses of fertilizers under the operation of the Fertilizer Law during the year 1921.

Those interested in the fertilization of different crops should apply to the College of Agriculture, the Experiment Station, or to their County Agent, and such literature as bears on the subject in which they are interested will be furnished. Bulletin No. 228 of the Experiment Station, showing the results obtained on the soil experiment fields, is of special interest to all users of fertilizers.

Samples Analyzed

During the year 1921, 889 brands of fertilizer were registered for sale. Of these, 421 were complete fertilizers containing all three of the essential ingredients—phosphoric acid, nitrogen and potash (non-acidulated bones containing potash are not included in this item); 124 acid phosphates; 180 nitrogenous superphosphates; 94 acid phosphate and potash mixtures; 64 bones, tankage and non-acidulated bones with potash; 4 nitrate of soda, and 2 potash salts.

Samples sent by manufacturers representing these various registrations, samples collected by our inspectors from fertilizers on sale in the State, and samples sent in by farmers, have been analyzed and the results are to be found in the following pages. The analyses have been grouped into tables according to the above classification and, in addition to the analysis, we have shown the index of relative value of each fertilizer, for the purpose of comparison. The following factors have been used in computing the index of relative value.

Available phosphoric acid in mixed fertilizers	1.5
Available phosphoric acid in acid phosphates	1.2
Insoluble phosphoric acid in mixed fertilizers	0.4
Phosphoric acid in bones	0.8
Nitrogen in all fertilizers	7.0
Potash in all fertilizers	4.0

Explanation of the Tables

In the tables of analyses, following the name of each brand, will be found the analysis of such samples as have been collected by our inspectors, sent in by farmers, or furnished by manufacturers, the manufacturer's guaranty being printed in italics. The figures set in bold-face type in these tables are those results which in the judgment of the Director are too low to be acceptable.

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	A. D. Adair and McCarty Bros., Inc., Atlanta, Ga.	
62359	Adair's Soluble Pacific Guano	Manufacturer ....
62360	McCarty's Soluble Fertilizer	Manufacturer ....
	The American Agr'l Chem. Co., Inc., Cin. Sales Dept., Cincinnati. O.	
60925	A. A. C. Kentucky Tobacco Grower	
62467		T. E. Richardson, Campbellsville ....
62468		John McCorley, Hopkinsville ....
62977		Frank Baker, Clarkson ....
62978		D. Sanders, McKinney ....
60929	A. A. C. Tobacco and Truck Fertilizer	Manufacturer ....
60938	Bowker's Harvest Bone Phosphate	
62872		Erlanger Hdw. Co., Erlanger ....
62983		T. E. Richardson, Campbellsville ....
60939	Bowker's Harvest Queen	Manufacturer ....
60940	Bowker's Fish Guano	
62476		T. E. Richardson, Campbellsville ....
62984		T. E. Richardson, Campbellsville ....
60941	Bowker's Corn and Wheat Phosphate	
62477		Gooch & Payne, Eubank ....
62478		C. E. Preston, Smith's Grove ....
62985		D. Sanders, McKinney ....
62986		W. F. Ham, Creston ....
60942	Bowker's Grain and Grass Grower	Manufacturer ....
60943	Bowker's Complete Fertilizer	
62479		W. R. Strange & Co., Middlesboro ...
62873		Carson Nash, Providence ....
60944	Bowker's Tobacco and Truck Grower	
62480		John Gilbert, Franklin ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.10	0.65	11.75	0.82		0.88	1.70	2.06	2.21		37.7	62359
10.00						*1.65*	*2.00*	*2.00*		*34.6*	
11.80	0.65	12.45	0.41		0.47	0.88	1.07	1.52		30.2	62360
10.00						*0.82*	*1.00*	*1.00*		*24.7*	
											60925
9.75	0.85	10.60		1.11	0.75	1.86	2.26	2.14		36.6	62467
8.70	1.50	10.20		0.91	0.77	1.68	2.04	2.06		33.7	62468
9.35	1.80	11.15		1.01	0.71	1.72	2.09	2.47		36.7	62977
8.85	1.95	10.80		1.28	0.60	1.88	2.28	2.44		37.0	62978
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
9.70	1.10	10.80		0.95	0.75	1.70	2.06	5.39		48.5	60929
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*45.2*	
											60938
9.80	2.00	11.80		0.35	0.39	0.74	0.90	0.52	0.70	25.6	62872
9.65	1.00	10.65		0.44	0.44	0.88	1.07	1.08		29.0	62983
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*23.3*	
9.65	0.65	10.30		0.39	0.49	0.88	1.07	2.11		29.3	60939
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*27.3*	
											60940
9.50	0.70	10.20		0.39	0.46	0.85	1.03	3.01		32.5	62476
8.90	0.90	**9.80**		0.44	0.46	0.90	1.09	2.10	0.79	31.6	62984
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*31.3*	
											60941
11.10	1.50	12.60		0.32	0.60	0.92	1.12	1.20		28.5	62477
11.25	1.00	12.25		0.37	0.52	0.89	1.08	1.17		28.2	62478
12.00	1.15	13.15		0.31	0.58	0.89	1.08	0.42	0.83	29.7	62985
11.65	1.10	12.75		0.37	0.57	0.94	1.14	1.15		29.1	62986
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
8.30	1.90	10.20		0.77	1.00	1.77	2.15	2.09		34.0	60942
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
											60943
13.30	1.10	14.40		0.88	0.69	1.57	1.91	2.96		43.2	62479
13.15	1.85	15.00		1.01	0.64	1.65	2.00	3.08		44.3	62873
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*43.2*	
											60944
11.45	0.80	12.25		**1.97**	**0.50**	2.47	3.00	1.13		39.3	62480
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*37.9*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.	
60945	Bowker's High Grade Tobacco Grower	
62874		Erlanger Hardware Co., Erlanger ....
62481		W. R. Strange & Co., Middlesboro ...
60947	Bowker's Tobacco Grower	
62482		John Gilbert, Franklin ....
60956	Bradley's Faultless Grain Grower	Manufacturer ....
60957	Bradley's Sure Crop	Manufacturer ....
60958	Bradley's Potato and Root Fertilizer	Manufacturer ....
60959	Bradley's Corn and Wheat Phosphate	Manufacturer ....
60960	Bradley's Grain and Grass Grower	Manufacturer ....
60961	Bradley's Complete Fertilizer	Manufacturer ....
60962	Bradley's Tobacco and Truck Grower	Manufacturer ....
60963	Bradley's H. Gr. Tobacco Grower	Manufacturer ....
60972	Cleveland Dryer Works Faultless Grain Grower	Manufacturer ....
60973	Cleveland Dryer Works Sure Crop	Manufacturer ....
60974	Cleveland Dryer Works Potato and Tobacco Fertilizer	Manufacturer ....
60975	Cleveland Dryer Works Phospho Bone	
62485		H D. Penn, Mannsville ....
60976	Cleveland Dryer Works Grain and Grass Grower	Manufacturer ....
60977	Cleveland Dryer Works Complete Fertilizer	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.95	2.25	11.20		0.84	0.78	1.62	1.97	5.02		45.8	60945 62874
11.30	0.70	12.00		1.81	0.64	2.45	2.97	3.20		47.2	62481
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*45.9*	
8.60	1.80	10.40		0.80	0.80	1.60	1.94	4.94		44.6	60947 62482
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*45.2*	
11.55	0.75	12.30		0.31	0.56	0.87	1.06	1.07		28.0	60956
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*23.3*	
9.65	0.65	10.30		0.39	0.49	0.88	1.07	2.11		29.3	60957
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*27.3*	
10.75	0.70	11.45		0.37	0.49	0.86	1.04	3.20		35.2	60958
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*31.3*	
10.95	1.60	12.55		0.45	0.44	0.89	1.08	0.62	0.56	28.0	60959
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
8.30	1.90	10.20		0.77	1.00	1.77	2.15	2.09		34.0	60960
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
13.05	2.00	15.05		1.12	0.51	1.63	1.98	2.16	0.99	44.4	60961
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*43.2*	
11.65	1.30	12.95		0.38	2.02	2.40	2.91	1.12		39.3	60962
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*37.9*	
11.55	1.15	12.70		0.31	2.21	2.52	3.06	3.00		47.4	60963
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*45.9*	
11.55	0.75	12.30		0.31	0.56	0.87	1.06	1.07		28.0	60972
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*23.3*	
9.65	0.65	10.30		0.39	0.49	0.88	1.07	2.11		29.3	60973
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*27.3*	
10.75	0.70	11.45		0.37	0.49	0.86	1.04	3.20		35.2	60974
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*31.3*	
11.60	0.60	12.20		0.20	0.71	0.91	1.10	1.12		28.5	60975 62485
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
8.30	1.90	10.20		0.77	1.00	1.77	2.15	2.09		34.0	60976
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
13.05	2.00	15.05		1.12	0.51	1.63	1.98	2.16	0.99	44.4	60977
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*43.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.	
60978	Cleveland Dryer Works Tobacco and Truck Grower	Manufacturer ....
60979	Cleveland Dryer Works H. Gr. Tobacco Grower	Manufacturer ....
60988	Red Line Complete Manure	
62490		Albert Long, Scottsville ....
62491		L. B. Sievers & Son, Somerset ....
62994		L. B. Sievers & Son, Somerset ....
60989	Michigan Carbon Works Sure Crop	
62492		L. B. Sievers & Son, Somerset ....
62879		The J. C. Vanarsdell Co., Lawrenceburg ....
62995		Frank Baker, Clarkson ....
62996		L. B. Sievers & Son, Somerset ....
60990	Homestead A-1 Potash Fertilizer	
62997		O. A. Lutes & Co., Shepherdsville ....
60991	Michigan Carbon Works Corn and Wheat Phosphate	
62493		Vine Grove Feed Co., Vine Grove ....
62998		C. P. Clarke, Owensboro ....
62999		Vine Grove Feed Co., Vine Grove ....
60993	Michigan Carbon Works Complete Fertilizer	
62494		Pollard Bros., Cropper ....
63000		Vine Grove Feed Co., Vine Grove ....
60994	Homestead Tob. and Truck Grower	
62495		Ellis & Overstreet, Lagrange ....
62880		The Jansen Hdw. Co., Covington .....
63001		C. P. Clarke, Owensboro ....
60995	Homestead Tobacco Grower	
62496		Bedford & Tuttle, Winchester ....
62497		Brown Lee-Kennady & Owens, Munfordville ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN					POTASH			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number.
11.65	1.30	12.95		0.38	2.02	2.40	2.91	1.12		39.3	60978
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*37.9*	
11.55	1.15	12.70		0.31	2.21	2.52	3.06	3.00		47.4	60979
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*45.9*	
											60988
8.90	1.10	10.00		0.32	0.57	0.89	1.08	0.99		24.0	62490
8.55	1.05	9.60		0.34	0.56	0.90	1.09	1.03		23.7	62491
9.65	1.30	10.95		0.44	0.54	0.98	1.19	0.44	0.78	26.7	62994
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*23.3*	
											60989
8.90	0.60	9.50		0.20	0.69	0.89	1.08	2.06		28.1	62492
9.25	1.35	10.60				0.95	1.15	2.09		29.4	62879
8.85	1.10	9.95		0.46	0.47	0.93	1.13	2.38		29.8	62995
8.90	0.90	9.80		0.51	0.47	0.98	1.19	0.66	1.31	28.5	62996
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*27.3*	
											60990
8.55	0.95	9.50		0.38	0.50	0.88	1.07	1.52	1.43	31.2	62997
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*31.3*	
											60991
11.45	0.70	12.15		0.21	0.60	0.81	0.98	1.11		27.6	62493
11.00	1.10	12.10		0.37	0.54	0.91	1.10		1.28	28.4	62998
10.60	1.60	12.20		0.32	0.56	0.88	1.07	1.08		27.0	62999
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
											60993
13.35	0.80	14.15		0.91	0.74	1.65	2.00	2.83		43.2	62494
12.65	1.65	14.30		1.05	0.72	1.77	2.15	2.28	0.86	44.6	63000
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*43.2*	
											60994
11.30	0.85	12.15		0.41	2.28	2.69	3.27	1.19		40.9	62495
11.60	1.55	13.15		1.90	0.69	2.59	3.14	1.16		40.8	62880
11.80	1.60	13.40		0.25	2.40	2.65	3.22	0.60	0.67	42.0	63001
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*37.9*	
											60995
11.10	0.70	11.80		0.37	2.33	2.70	3.28	2.92		47.5	62496
11.15	0.85	12.00		1.74	0.84	2.58	3.13	2.78		46.3	62497
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*45.9*	

TABLE 1.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.	
60997	Homestead Potato and Tob. Special	
62498		Pollard Bros., Cropper
62881		Frank Baker, Clarkson
60998	Homestead Tobacco Grower 1916	
62499		Lebanon Carriage & Impl. Co., Lebanon
60999	Homestead A Bone Black Fertilizer	
62500		Brown Lee-Kennady & Owen, Munfordville
62501		L. B. Sievers & Son, Somerset
62882		Broadway Coal Co., Mayfield
63003		Frank Baker, Clarkson
63004		L. B. Sievers & Son, Somerset
62000	Red Line Crop Grower	
63005		Denton Hardware Co., Madisonville
62009	N. W. Horseshoe Br. Dark Tobacco Grower	
62508		Woodson Lewis, Greensburg
62509		F. M. Mitchell, Scottsville
62010	N. W. Horseshoe Brand Sure Crop	Manufacturer
62011	N. W. Horseshoe Br. Potash Manure	
63010		Woodson Lewis, Greensburg
62012	N. W. Horseshoe Brand Corn and Wheat Phosphate	
62509-A		John R. Nelson, Eubank
63011		E. S. Ferrill & Son, Buffalo
62013	N. W. Horseshoe Brand Challenge Corn Grower	
62884		Grayson County Supply Co., Leitchfield
62014	N. W. Horseshoe Brand Complete Fertilizer.	Manufacturer

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											60997
8.65	1.05	9.70		0.80	0.86	1.66	2.02	4.94		44.8	62498
8.10	2.10	10.20		0.80	0.70	1.50	1.82	5.01		43.5	62881
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*45.2*	
											60998
11.10	1.90	13.00		1.56	1.08	2.64	3.20	1.33		41.2	62499
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*37.9*	
											60999
7.95	1.10	9.05		1.15	0.97	2.12	2.57	1.44		33.0	62500
9.65	0.55	10.20		1.21	0.88	2.09	2.54	1.04	0.75	36.5	62501
9.50	2.30	11.80		1.29	1.05	2.34	2.84	1.73		38.5	62882
10.20	1.50	11.70		1.31	0.72	2.03	2.46	0.52	1.13	36.7	63003
10.05	1.20	11.25		1.15	0.87	2.02	2.45	1.71		36.5	63004
8.00	*4.00*	*12.00*				*2.06*	*2.50*	*1.50*		*34.0*	
											62000
10.85	1.10	11.95		0.83	0.96	1.79	2.17	2.43		39.0	63005
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
											62009
9.00	0.70	9.70		0.31	0.62	0.93	1.13	1.06		24.5	62508
8.55	0.90	9.45		0.28	0.59	0.87	1.06	1.07		23.6	62509
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*23.3*	
9.65	0.65	10.30		0.39	0.49	0.88	1.07	2.11		29.3	62010
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*27.3*	
											62011
9.10	0.70	9.80		0.70	0.22	0.92	1.12	2.87		31.9	63010
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*31.3*	
											62012
10.25	0.60	10.85		0.37	0.42	0.79	0.96	0.66	0.50	25.8	62509A
10.80	1.60	12.40		0.35	0.60	0.95	1.15	1.24		28.5	63011
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
											62013
9.20	2.05	11.25		1.05	0.77	1.82	2.21	2.13		35.9	62884
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
13.05	2.00	15.05		1.12	0.51	1.63	1.98	2.16	0.99	44.4	62014
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*43.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.	
62015	N. W. Horseshoe Brand Tobacco and Truck Grower	Manufacturer ....
62016	N. W. Horseshoe Brand H. Gr. Tobacco Grower	
62510		J. I. Rice, Adairville ....
62511		Dickey & Co., Glasgow ....
62018	N. W. Horseshoe Br. Tobacco Grower	Manufacturer ....
62019	N. W. Horseshoe Br. Corn and Wheat Grower 1916	Manufacturer ....
62028	Packers Boar's Head Br. Faultless Grain Grower	Manufacturer ....
62029	Packers Boar's Head Br. Sure Crop	Manufacturer ....
62030	Packers Boar's Head Brand Sure Growth Potash Manure	Manufacturer ....
62031	Packers Boar's Head Brand Corn and Wheat Phosphate	Manufacturer ....
62032	Packers Boar's Head Br. Corn and Wheat Grower	Manufacturer ....
62033	Packers Boar's Head Brand Complete Fertilizer	Manufacturer ....
62034	Packers Boar's Head Brand Tobacco and Truck Grower	Manufacturer ....
62035	Packers Boar's Head Brand High Grade Tobacco Grower	Manufacturer ....
62037	Packers Boar's Head Brand High Grade Vegetable Fertilizer	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.65	1.30	12.95		0.38	2.02	2.40	2.91	1.12		39.3	62015
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*37.9*	
											62016
10.10	0.85	**10.95**		1.71	0.77	2.48	3.01	2.89		**44.4**	62510
9.80	1.45	**11.25**		1.47	0.86	2.37	2.88	2.73		**42.8**	62511
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*45.9*	
9.70	1.10	10.80		0.95	0.75	1.70	2.06	5.39		48.5	62018
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*45.2*	
9.55	1.20	10.75		1.07	0.70	1.77	2.15	0.66	0.57	30.9	62019
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*1.00*		*29.2*	
11.55	0.75	12.30		0.31	0.56	0.87	1.06	1.07		28.0	62028
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*23.3*	
9.65	0.65	10.30		0.39	0.49	0.88	1.07	2.11		29.3	62029
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*27.3*	
10.75	0.70	11.45		0.37	0.49	0.86	1.04	3.20		35.2	62030
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*31.3*	
10.95	1.60	12.55		0.45	0.44	0.89	1.08	0.62	0.56	28.0	62031
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
8.30	1.90	10.20		0.77	1.00	1.77	2.15	2.09		34.0	62032
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
13.05	2.00	15.05		1.12	0.51	1.63	1.98	2.16	0.99	44.4	62033
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*43.2*	
11.65	1.30	12.95		0.38	2.02	2.40	2.91	1.12		39.3	62034
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*37.9*	
11.55	1.15	12.70		0.31	2.21	2.52	3.06	3.00		47.4	62035
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*45.9*	
9.70	1.10	10.80		0.95	0.75	1.70	2.06	5.39		48.5	62037
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*45.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works, Louisville, Ky., Nashville, Tenn., and Cincinnati, Ohio	
60852	Armour's Simpson County Tobacco Grower	Manufacturer
60853	Armour's Dark Tobacco Grower	Manufacturer
60855	Armour's H. Grade Potato Grower	Manufacturer
60857	Armour's Golden Grain Grower	Manufacturer
60858	Armour's Tobacco Guano	
62513		W. O. Cropper, Burtonville
60859	Armour's Special Tobacco Grower	Manufacturer
60860	Armour's Standard	
62514		D. M. Brakefield, Adairville
62515		F. T. Cantrell, Greensburg
60861	Armour's Big Crop Tobacco Maker	
62516		F. T. Cantrell, Greensburg
62886		L. Jackson, Caneyville
60868	Armour's Corn and Tobacco Grower	
62523		Thurman & Enlow, Hodgenville
62524		Rector Bros., Lewisburg
62539		F. T. Cantrell, Greensburg
60869	Armour's Special Grain Grower Formula	
62525		W. N. Stice, Cerulean
60870	Armour's Wheat, Corn and Oats Special	
62526		W. O. Cropper, Burtonville
62888		S. Skaggs, Clarkson
60871	Armour's Record Brand	
62527		W. O. Cropper, Burtonville

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.40	2.40	13.80		0.49	0.51	1.00	1.21	0.76	1.26	33.1	60852
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*2.00*	*27.3*	
12.20	2.60	14.80		0.83	0.67	1.50	1.82	0.72		32.7	60853
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*0.50*	*24.2*	
9.85	2.85	12.70		0.51	0.39	0.90	1.09	0.82	2.15	34.1	60855
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*3.00*	*31.3*	
10.60	2.30	12.90		1.11	0.75	1.86	2.26	0.64	0.45	34.2	60857
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*1.00*	*29.2*	
											60858
8.55	0.25	8.80	0.38	0.70	0.61	1.69	2.05	1.64		31.3	62513
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*1.00*	*29.2*	
12.55	1.75	14.30		1.08	0.79	1.87	2.27	0.68	0.62	37.8	60859
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*1.00*	*32.2*	
											60860
9.10	2.40	11.50	0.50	0.55	0.57	1.62	1.97	2.11		34.4	62514
8.45	0.30	8.75		1.02	0.59	1.61	1.95	1.78		31.2	62515
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
											60861
9.50	0.30	9.80	0.51	0.41	0.63	1.55	1.88	1.04	2.28	38.5	62516
8.75	1.15	9.90		0.53	0.77	1.30	1.58	0.52	2.85	36.2	62886
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*4.00*	*41.2*	
											60868
11.25	0.90	12.15	0.49			0.49	0.59	1.12		25.2	62523
12.75	1.95	14.70		0.40	0.30	0.70	0.85	0.85		28.2	62524
11.20	0.35	11.55				0.48	0.58	1.26		25.3	62539
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
											60869
10.70	2.90	13.60				0.39	0.47	0.86	1.14	27.9	62525
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*2.00*	*24.5*	
											60870
9.30	0.30	9.60		0.30	0.62	0.92	1.12	1.50		26.5	62526
7.70	0.90	8.60				0.75	0.91	1.05		21.4	62888
7.00	*4.00*	*11.00*				*0.82*	*1.00*		*1.00*	*21.8*	
											60871
10.45	0.80	11.25	0.28	0.22	0.35	0.85	1.03	1.26		27.0	62527
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*26.3*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works.	
60872	Armour's Big Crop Champion	
62528		Chas. Embry, Moberly ....
60873	Armour's Big Crop Tobacco and Potato Grower	
62529		Shelby Co. Feed & Grain Co., Shelbyville ....
60874	Armour's Big Crop Plant Bed Special	
62530		The Jenkins-Essex Co., Elizabethtown
60875	Armour's Big Crop Truck Grower	Manufacturer ....
60901	Ideal H. Gr. Blood and Bone	Manufacturer ....
60903	Ideal Tobacco Grower	Manufacturer ....
60904	Ideal Grain Grower	Manufacturer ....
60906	Ideal Truck and H. Gr. Tob. Grower	
62892		The T. J. Turley Co., Owensboro .....
60907	Ideal Special Tobacco Guano	Manufacturer ....
62818	Armour's Standard Mixture	
63018		S. D. Holland & Co., Gamaliel ....
63019		L. Jackson, Caneyville ....
62819	Armour's Champion	Manufacturer ....
62820	Armour's Wheat, Corn and Oats	
63020		Thurman & Enlow, Hodgenville .....
63021		S. D. Holland & Co., Gamaliel ....
62821	Armour's Kentucky Colonel	Manufacturer ....
62824	Armour's Grain Grower	
63024		McLean County Hdw. Co., Calhoun ..
63025		The T. J. Turley Co., Owensboro ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN					POTASH			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number.
											60872
11.15	2.80	13.95	0.86	0.55	0.48	1.89	2.29	1.12	0.58	37.9	62528
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
											60873
10.40	0.40	10.80		0.71	0.99	1.70	2.06	2.21		36.5	62529
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
											60874
12.50	0.50	13.00		1.42	0.63	2.05	2.49	1.38		38.8	62530
12.00	*4.00*	*16.00*				*2.47*	*3.00*		*2.00*	*44.9*	
9.85	1.80	11.65		2.19	1.33	3.52	4.27	2.24	0.85	52.5	60875
8.00	*4.00*	*12.00*				*3.29*	*4.00*		*3.00*	*48.6*	
11.30	2.15	13.45		1.60	0.96	2.56	3.11	1.30		40.9	60901
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*1.00*	*37.9*	
12.55	1.75	14.30		1.08	0.79	1.87	2.27	0.68	0.62	37.8	60903
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*1.00*	*32.2*	
9.25	3.50	12.75		0.49	0.46	0.95	1.15	1.02		26.0	60904
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*1.00*	*23.3*	
											60906
10.90	1.35	12.25	0.46	0.58	0.47	1.51	1.83	1.86	4.74	53.9	62892
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*8.00*	*60.2*	
11.40	2.45	13.85		0.93	0.80	1.73	2.10	0.94	1.30	39.2	60907
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
											62818
10.20	3.30	13.50		0.55	0.36	0.91	1.10	1.47		28.9	63018
8.45	3.70	12.15		0.45	0.24	0.69	0.84	1.03		23.1	63019
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*23.3*	
9.15	4.80	13.95		0.59	0.31	0.90	1.09	4.35		39.4	62819
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*4.00*		*35.3*	
											62820
12.15	1.70	13.85		0.39	0.38	0.77	0.93	1.08		28.6	63020
11.75	2.10	13.85		0.59	0.31	0.90	1.09	1.17		29.5	63021
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*1.00*		*29.3*	
11.05	4.50	15.55		0.53	0.32	0.85	1.03	2.54		34.5	62821
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*2.00*		*30.3*	
											62824
11.05	1.90	12.95		0.79	0.40	1.19	1.44	1.81		33.0	63024
10.05	2.00	12.05		0.81	0.52	1.33	1.61	1.94		33.0	63025
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works.	
62825	Armour's Big Crop Beef, Blood and Bone	
63026		Sherman Skaggs, Clarkson
62826	Armour's Big Crop H. Grade Potato Grower	Manufacturer
62832	Armour's Big Crop Favorite	Manufacturer
62859	Armour's Big Crop Guano	Manufacturer
60885	Tuscarora Corn and Tobacco Grower	
62540		Horton Bros., Bethesda
62541		J. R. Davis & Bro., Campbellsville
60886	Tuscarora Acid and Ammonia	Manufacturer
60887	Tuscarora Ammoniated Phosphate	Manufacturer
60888	Tuscarora Crop Grower	Manufacturer
60890	Tuscarora Golden Grain Grower	Manufacturer
60891	Tuscarora Standard	
62542		J. R. Davis & Bro., Campbellsville
60892	Tuscarora Special Tobacco Grower	
62543		Cadiz Hardware Co., Cadiz
60893	Tuscarora Tobacco Guano	Manufacturer
60894	Tuscarora Plant Bed Special	Manufacturer
	The C. S. Brent Seed Co., Inc., Lexington, Ky.	
62761	Brent's Tobacco and Truck Grower	
62893		Manufacturer's warehouse

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62825
13.65	0.30	13.95		0.65	0.99	1.64	1.99	2.76		43.1	63026
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*39.2*	
11.85	4.50	16.35		1.04	0.75	1.79	2.17		4.03	48.2	62826
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*44.2*	
13.50	2.15	15.65		1.17	0.61	1.78	2.16		6.24	58.5	62832
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*6.00*		*55.2*	
10.65	3.90	14.55		0.97	0.62	1.59	1.93	2.12		37.2	62859
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*2.00*		*36.2*	
											60885
9.20	0.20	9.40				0.44	0.53	1.05		21.2	62540
12.10	0.45	12.55				0.43	0.52	1.23		26.3	62541
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
14.55	2.95	17.50				0.47	0.57	0.25		27.3	60886
14.00	*4.00*	*18.00*				*0.41*	*0.50*		*1.00*	*39.5*	
9.20	3.60	12.80		0.97		0.97	1.18	0.30		23.2	60887
7.00	*4.00*	*11.00*				*0.82*	*1.00*		*1.00*	*21.8*	
12.20	2.65	14.85		0.48	0.46	0.94	1.14	1.12		30.4	60888
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*26.3*	
10.60	2.30	12.90		1.11	0.75	1.86	2.26	0.64	0.45	34.2	60890
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*1.00*	*29.2*	
											60891
9.45	1.15	9.60	0.22	0.45	0.93	1.60	1.94	1.82		33.1	62542
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
											60892
9.50	1.15	10.65	0.22	0.35	0.32	0.89	1.08	2.10		29.3	62543
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
11.40	2.45	13.85		0.93	0.80	1.73	2.10	0.94	1.30	39.2	60893
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
13.90	1.20	15.10		1.52	0.90	2.42	2.94	1.00	1.52	48.4	60894
12.00	*4.00*	*16.00*				*2.47*	*3.00*		*2.00*	*44.9*	
											62761
10.40	1.10	11.50	0.42		0.42	0.84	1.02	2.31		31.3	62893
8.90						*1.65*	*2.00*		*3.00*	*35.6*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The C. S. Brent Seed Co.	
62762	Brent's Grain Grower	
62894		Manufacturer's warehouse ....
	Calumet Fertilizer Co., New Albany, Ind.	
62381	Calumet Brand High Grade Manure	
62895		Conner-Hayden & Co., Bardstown ....
62382	Calumet Brand Ky. Corn and Wheat Grower	Manufacturer ....
62383	Calumet Br. Corn and Wheat Special	
63035		M. C. Marion & Son, Elizabethtown ..
63036		A. W. Tarter, Columbia ....
62385	Calumet Br. Two Eight Two	Manufacturer ....
62386	Calumet Brand Ky. Tobacco Grower	Manufacturer ....
62387	Calumet Brand High Grade Tobacco and Truck Grower	
63037		Harvey Stout, Fern Creek ....
62390	Calumet Brand Bone Phosphate and Potash Mixture	Manufacturer ....
62392	Calumet Brand Half Eight Three	Manufacturer ....
62393	Calumet Brand Tobacco Manure	
62896		J. B. Taylor & Sons, Lewisport ......
62396	Calumet Brand Half Ten Two	Manufacturer ....
62397	Calumet Brand Half Thirteen One	
63038		M. C. Marion & Son, Elizabethtown ..
62398	Calumet Brand Half Seven Ten	Manufacturer ....
62400	Calumet Brand Potato and Tobacco Special	Manufacturer ....

Complete Fertilizers.

Phosphoric Acid			Nitrogen					Potash			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number.
											62762
10.45	0.65	11.10				0.80	0.97	1.18		26.3	62894
8.00						*0.82*	*1.00*		*1.00*	*21.7*	
											62381
10.65	0.40	11.05		0.28	0.28	0.56	0.68	0.46	0.55	24.1	62895
9.00	*4.00*	*13.00*				*1.23*	*1.50*		*1.00*	*27.7*	
9.50	1.20	10.70		0.60		0.60	0.73		0.68	21.7	62382
8.50	*4.00*	*12.50*				*0.61*	*0.74*		*0.50*	*20.6*	
											62383
10.50	1.70	12.20	0.24	0.70	0.66	1.60	1.94	0.84	1.61	37.4	63035
11.40	1.70	13.10	0.24	0.69	0.75	1.68	2.04	0.76	1.72	39.5	63036
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
9.25	1.45	10.70		1.04	0.54	1.58	1.92	0.60	1.31	33.2	62385
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
10.05	1.15	11.20		1.38	0.66	2.04	2.48	3.22	4.32	60.0	62386
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*8.00*	*57.2*	
											62387
12.40	1.35	13.75		1.45	0.95	2.40	2.91	1.50	2.46	51.8	63037
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*4.00*	*49.9*	
10.80	1.25	12.05				0.41	0.50		1.14	24.1	62390
10.00	*4.00*	*14.00*				*0.41*	*0.50*		*1.00*	*23.5*	
9.40	1.00	10.40				0.36	0.44	0.78	2.33	29.5	62392
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*3.00*	*28.5*	
											62393
9.30	0.80	10.10		0.50	0.36	0.86	1.04	1.68	1.81	34.3	62896
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*3.00*	*31.3*	
10.50	1.00	11.50				0.40	0.49	0.82	1.36	27.7	62396
10.00	*4.00*	*14.00*				*0.41*	*0.50*		*2.00*	*27.5*	
											62397
14.00	1.45	15.45				0.40	0.49		1.14	28.9	63038
13.00	*2.50*	*15.50*				*0.41*	*0.50*		*1.00*	*27.4*	
9.35	0.65	10.00				0.39	0.47	1.60	7.43	53.1	62398
7.00	*3.00*	*10.00*				*0.41*	*0.50*		*10.00*	*54.6*	
10.00	0.75	10.75		0.98	0.57	1.55	1.88	1.50	1.72	39.0	62400
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*37.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Calumet Fertilizer Co.	
62405	Calumet Brand Half and Half	
63039		M. C. Marion & Son, Elizabethtown ..
	The Cincinnati Phosphate Co. (Armour owned), Cincinnati, O.	
62320	High Grade Manure	
62321	Tobacco and Potato Grower	
62898		H. W. Ryle, Erlanger ....
62322	Grain and Grass Grower	
62545		Hiner & Stricklett, Vanceburg ......
62323	Crop Booster	
62324	Conservation Brand	
62546		Hiner & Stricklett, Vanceburg ....
62786	High Grade Manure	Manufacturer ....
62787	Grain and Grass Grower	Manufacturer ....
62788	Crop Booster	Manufacturer ....
62789	Sure Crop	Manufacturer ....
62790	Grain Grower	Manufacturer ....
62856	"X" Favorite Grain Grower	Manufacturer ....
	Consolidated Chemical Co., Louisville, Ky.	
60690	Camel Brand Corn and Wheat Special	
62547		Ky. Feed & Grain Co., Middlesboro ..
62899		Horton Bros., Burnside ....
63042		Zula Mill Co., Burnside ....
63043		J. W. Sweeney, Waynesburg ....
60691	Camel Brand Grain Grower	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62405
11.90	2.70	14.60				2.12	2.57	0.94		37.5	63039
6.00	*6.00*	*12.00*				*2.06*	*2.50*		*1.00*	*29.8*	
											62320
11.00	*1.00*	*12.00*				*0.82*	*1.00*	*1.00*		*26.6*	
											62321
9.90	0.70	10.60				0.81	0.98	2.84	0.82	35.4	62898
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*34.1*	
											62322
9.20	1.30	10.50		0.31	0.51	0.82	1.00	1.86		27.5	62545
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*2.00*		*26.1*	
											62323
10.00	*1.00*	*11.00*				*0.41*	*0.50*	*1.00*		*22.3*	
											62324
13.10	1.20	14.30		1.01	0.64	1.65	2.00	1.86		39.1	62546
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*38.0*	
11.25	2.70	13.95		0.37	0.49	0.86	1.04	1.19		28.7	62786
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*28.1*	
10.25	2.55	12.80		0.29	0.50	0.79	0.96	2.30		31.1	62787
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*29.1*	
10.00	2.30	12.30		0.37	0.58	0.95	1.15	1.08		26.9	62788
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*25.1*	
11.30	1.95	13.25		2.02		2.02	2.45	4.26		48.9	62789
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*43.0*	
8.40	2.35	10.75	0.70	0.25	0.74	1.69	2.05	2.15		34.0	62790
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*32.0*	
8.55	1.25	9.80		0.66	0.26	0.92	1.12	1.28		24.9	62856
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*22.1*	
											60690
11.30	2.20	13.50				0.60	0.73	0.60	0.70	27.2	62547
12.50	1.10	13.60				0.53	0.64	1.01		26.9	62899
14.75	2.20	16.95	0.54			0.54	0.66		1.32	32.1	63042
13.85	2.00	15.85	0.64			0.64	0.78		1.47	31.9	63043
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
13.35	0.45	13.80	0.50			0.50	0.61		0.84	27.1	60691
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*0.50*	*23.0*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Consolidated Chemical Co.	
60692	Camel Br. Universal Crop Fertilizer	Manufacturer ....
60693	Camel Brand Vegetable Potato and Tobacco Special	Manufacturer ....
60694 63044	Camel Brand Blue Grass Tobacco Gr.	 Zula Mill Co., Burnside ....
60695 63045	Camel Brand High Grade Special	 Will Garner, Burnside ....
60696 63046	Camel Brand Extra High Grade Tobacco Fertilizer	 Will Garner, Burnside ....
60697 62548 63047	Camel Brand Tobacco Fertilizer	 T. H. O'Bryan, Dawson Springs ...... Will Garner, Burnside ....
60698 62549	Camel Br. Standard Grain Fertilizer	 Beck Creek Farmers' Club, Parker ..
60699	Camel Br. General Crop Fertilizer	Manufacturer ....
60700 62900	Camel Br. One Ten One Fertilizer	 Grayson County Supply Co., Leitchfield
60709	Camel Brand Bright Tobacco Special	Manufacturer ....
60710	Camel Br. Truck and Tobacco Fertilizer	Manufacturer ....
	Duncan & Sherley, Lagrange, Ky.	
62373	Tiger Brand Tobacco Grower	
	The Empire Guano Co., Nashville, Tenn.	
60730	Wheat, Oat and Corn Grower	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
12.60	0.50	13.10	1.04			1.04	1.26	0.62	0.91	32.5	60692
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*29.3*	
12.70	0.40	13.10	1.00		0.24	1.24	1.51	1.28	1.50	39.0	60693
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*35.8*	
9.30	2.00	11.30	1.52			1.52	1.85		4.40	43.0	60694 63044
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*4.00*	*38.2*	
10.60	2.00	12.60	0.96		0.92	1.88	2.28		2.50	39.9	60695 63045
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
10.15	2.30	12.45	1.02		0.64	1.66	2.02	4.19		44.5	60696 63046
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*44.2*	
9.80	1.20	11.00	0.54	0.35	0.83	1.72	2.09	1.22	1.16	36.7	60697 62548
10.00	2.00	12.00	0.96		0.71	1.67	2.03		2.27	36.6	63047
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
9.10	0.20	9.30	0.39	0.35	0.91	1.65	2.00	2.22		34.2	60698 62549
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
10.55	0.40	10.95	0.87			0.87	1.06	1.00	2.16	34.7	60699
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
10.00	1.35	11.35	0.38		0.45	0.83	1.01	1.14		25.9	60700 62906
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*26.3*	
10.05	0.45	10.50	1.99			1.99	2.42	1.40	0.43	36.5	60709
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*30.7*	
9.80	0.25	10.05	1.97		0.20	2.17	2.63	1.44	2.09	44.1	60710
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*3.00*	*42.9*	
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*37.2*	62373
8.30	6.80	15.10	0.39		0.73	1.12	1.36	1.55		29.2	60730
7.00	*10.00*	*17.00*				*0.82*	*1.00*	*1.00*		*24.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Empire Guano Co.	
60731	Climax Tobacco Grower	Manufacturer ....
60732	Blood, Bone and Potash	Manufacturer ....
60733	Kentucky Premium Guano	Manufacturer ....
60734	High Grade Tobacco Grower	Manufacturer ....
60735	Red Banner Special	Manufacturer ....
60736	Wheat and Corn Grower	Manufacturer ....
60739	Clover and Wheat Special	Manufacturer ....
	The Evansville Packing Co., Evansville, Ind.	
62282	Grain Booster	Manufacturer ....
62283	Farmer's Pride	Manufacturer ....
62284	Harvest King	Manufacturer ....
62286 62560	Three "B"	 Eldred Hardware Co., Princeton .....
62287	Corn and Wheat Special	Manufacturer ....
62288	Half and Half Mixture	Manufacturer ....
	Federal Chemical Co., Inc., Louisville, Ky.	
62090 62561	Standard Grain Grower	 T. N. Butt, Crab Orchard ....
62091 62902	Tobacco Truck and Tomato Fertilizer	 Grayson County Supply Co., Leitchfield
62092	Potato Maker and Tobacco Fertilizer	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.85	8.20	19.05		0.67	0.39	1.06	1.29	1.52		33.1	60731
8.00	*7.00*	*15.00*				*0.82*	*1.00*		*1.00*	*24.5*	
10.70	5.55	16.25		1.29	0.48	1.77	2.15	2.93		42.4	60732
8.00	*5.00*	*13.00*				*1.65*	*2.00*	*2.00*		*33.6*	
9.40	5.00	14.40	0.33	0.58	0.20	1.11	1.35	4.94		43.6	60733
8.00	*5.00*	*13.00*				*0.41*	*0.50*	*4.00*		*32.9*	
11.05	5.70	16.75		1.49	0.31	1.80	2.19	4.71		50.3	60734
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*4.00*	*41.6*	
12.50	2.00	14.50		1.14	0.54	1.68	2.04	3.70		46.1	60735
10.00	*5.00*	*15.00*				*1.65*	*2.00*	*2.00*		*36.6*	
12.80	3.30	16.10	0.45		0.34	0.79	0.96	1.78		33.2	60736
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*25.4*	
12.90	2.30	15.20		0.90	0.31	1.21	1.47	2.71		39.6	60739
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*2.00*		*32.9*	
11.10	0.15	11.25				1.25	1.52	1.12		29.9	62282
8.00						*0.82*	*1.00*	*1.00*		*21.7*	
15.55	0.25	15.80				0.82	1.00	0.74		32.1	62283
12.00						*0.82*	*1.00*	*1.00*		*27.7*	
8.95	0.55	9.50	0.80		0.41	1.21	1.47	1.10	0.74	29.5	62284
8.00						*1.00*	*1.21*	*1.00*		*23.0*	
											62286
8.55	0.15	8.70	1.48		0.51	1.99	2.42	1.70	0.91	37.3	62560
8.00						*1.65*	*2.00*	*2.00*		*31.6*	
10.35	0.30	10.65				0.93	1.13	**1.08**	**1.09**	**30.8**	62287
12.00						*0.82*	*1.00*	*3.00*		*35.7*	
11.10	0.35	11.45				**2.01**	2.44	0.99		**34.8**	62288
10.00						*2.47*	*3.00*	*1.00*		*36.3*	
											62090
10.80	2.70	13.50				0.85	1.03	1.43		29.0	62561
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*26.3*	
											62091
9.40	0.50	**9.90**		1.02	0.43	1.45	1.76	1.36		29.9	62902
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*30.7*	
11.40	9.80	21.20		2.00		2.00	2.43	1.87		42.5	62092
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*30.7*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co., Inc.	
62093	Standard Corn and Wheat Grower	
63058		Grayson County Supply Co., Leitchfield
62094	Premium High Grade Fertilizer	Manufacturer
62095	Special Tobacco Maker	Manufacturer
62096	Beef, Blood and Bone	
62562		Thompson Fertilizer Co., Mt. Sterling.
63059		Burk & Price, Owensboro
62097	Loam Land Fertilizer	Manufacturer
62098	Mid-West High Grade Mixture	
62563		A. W. Tarter, Columbia
62116	Daybreak A-1 Champion	Manufacturer
62117	Daybreak Wheat and Corn Special	
62569		A. W. Tarter, Columbia
62570		Johnson & Viers, Elizabethtown
63064		A. W. Tarter, Columbia
63065		J. A. Shaver, Greenville
62118	Daybreak Cracker-Jack	Manufacturer
62119	Daybreak Special	Manufacturer
62120	Royal Wheat and Grain Special	
63066		J. M. Johnson and W. W. Brown, Ordinary
63067		Grayson County Supply Co., Leitchfield
62121	Daybreak Special Manure	Manufacturer
62122	Daybreak Tobacco Manure	
62571		A. W. Tarter, Columbia
62123	Daybreak Favorite	
63068		Barnett Bros., London

Complete Fertilizers.

Phosphoric Acid			Nitrogen				Equivalent to Ammonia	Potash		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62093
10.40	1.00	11.40		1.01	0.75	1.76	2.14	2.15		36.9	63058
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
13.30	6.80	20.10		1.90	0.20	2.10	2.55	1.48	1.09	47.7	62094
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
13.25	7.10	20.35		2.11		2.11	2.56	1.64	1.00	48.1	62095
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
											62096
9.40	1.00	10.40	1.05		0.50	1.55	1.88	2.59		35.7	62562
11.55	1.55	13.10		0.76	0.79	1.55	1.88	2.37		38.3	63059
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
14.80	1.90	16.70		3.21		3.21	3.90		2.91	57.1	62097
12.00	*4.00*	*16.00*				*1.65*	*2.00*		*2.00*	*39.2*	
											62098
9.90	1.65	11.55	0.72		0.49	1.21	1.47	3.44		37.7	62563
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*44.2*	
13.90	8.20	22.10		0.82		0.82	1.00	1.16		34.5	62116
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*23.7*	
											62117
12.40	2.75	15.15				0.52	0.63	1.32		28.6	62569
10.15	0.75	10.90				0.56	0.68	1.67		26.1	62570
12.95	1.70	14.65				0.35	0.42	0.74		25.5	63064
13.60	1.70	15.30				0.33	0.40	0.99		27.4	63065
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
15.75	5.50	21.25		0.83		0.83	1.01	0.70	0.87	37.9	62118
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*28.0*	
14.50	4.70	19.20		0.86		0.86	1.04	0.72	5.28	53.7	62119
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*41.0*	
											62120
14.75	0.75	15.50		0.35	0.35	0.70	0.85	1.38		32.9	63066
13.85	0.60	14.45		0.41	0.36	0.77	0.93	1.32		31.7	63067
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*29.3*	
12.95	9.60	22.55		1.12		1.12	1.36	0.80	1.52	40.4	62121
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62122
11.00	1.75	12.75				1.15	1.40	2.37		34.7	62571
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62123
11.95	0.55	12.50		0.38	0.32	0.70	0.85	3.64		37.6	63068
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*35.8*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co., Inc.	
62124	Standard Crop and Tobacco Grower	Manufacturer ....
62125	Daybreak Tobacco Grower	Manufacturer ....
62126	Daybreak Vegetable Grower	Manufacturer ....
62127	Daybreak Special Tobacco Grower	Manufacturer ....
62351	Ammoniated Potash Ten	Manufacturer ....
62355	Special Two Eight Three	Manufacturer ....
62758	Special Three Eight Four	Manufacturer ....
62759	Special One Eight Three	Manufacturer ....
62143	1st Prize Corn and Wheat Champion	Manufacturer ....
62144	1st Prize Corn, Wheat and Oats Grower	
62905		Taylor Cherry, Clarkson ....
63072		Henderson Feed Co., Owensboro .....
62145	1st Prize Grain Maker	Manufacturer ....
62146	1st Prize Special	Manufacturer ....
62147	1st Prize Wheat and Grain Special	Manufacturer ....
62148	Blue Ribbon Corn and Wheat Grower	Manufacturer ....
62149	Blue Ribbon Tobacco Grower	Manufacturer ....
62150	1st Prize Formula	Manufacturer ....
62151	1st Prize Crop and Tobacco Grower	Manufacturer ....
62350	1st Prize Tobacco and Veg. Grower	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.45	8.00	19.45		1.62		1.62	1.97	1.48	3.86	53.1	62124
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*35.3*	
11.30	10.60	21.90		2.12		2.12	2.57	1.78	0.74	46.1	62125
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
10.85	8.90	19.75		2.15		2.15	2.61	1.38	4.49	58.4	62126
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*45.2*	
10.25	8.95	19.20		1.76		1.76	2.14	1.76	5.06	58.6	62127
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*6.00*	*46.2*	
9.30	8.00	17.30		1.55		1.55	1.88	2.52	9.65	76.7	62351
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*10.00*	*59.3*	
14.20	7.85	22.05		2.12		2.12	2.57	2.76	0.88	53.8	62355
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*37.2*	
10.60	8.25	18.85		2.27	0.38	2.65	3.22	1.20	3.54	56.7	62758
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*4.00*	*46.9*	
10.90	10.40	21.30		1.38		1.38	1.68	0.76	2.58	43.5	62759
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*3.00*	*31.3*	
13.90	8.20	22.10		0.82		0.82	1.00	1.16		34.5	62143
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*23.7*	
											62144
11.40	0.70	12.10				0.41	0.50	1.07		24.5	62905
12.70	2.30	15.00				0.38	0.46	1.19		27.4	63072
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
15.75	5.50	21.25		0.83		0.83	1.01	0.70	0.87	37.9	62145
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*28.0*	
14.50	4.70	19.20		0.86		0.86	1.04	0.72	5.28	53.7	62146
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*41.0*	
15.30	6.25	21.55		1.04		1.04	1.26	0.74	1.17	40.4	62147
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*29.3*	
12.95	9.60	22.55		1.12		1.12	1.36	0.80	1.52	40.4	62148
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
15.20	6.80	22.00		1.13		1.13	1.37	1.86	0.43	42.6	62149
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
11.10	9.30	20.40		1.64		1.64	1.99	0.88	2.51	45.4	62150
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*35.8*	
11.45	8.00	19.45		1.62		1.62	1.97	1.48	3.86	53.1	62151
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*35.3*	
10.25	8.95	19.20		1.76		1.76	2.14	1.76	5.06	58.6	62350
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*6.00*	*46.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Fox Chemical Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62164	Fox Ideal Fertilizer	
62576		J. S. Whitfill, Big Clifty ....
63073		Lancaster-Smith Seed Co., Owensboro.
62165	Fox Blood, Bone, Phosphate and Potash	
62577		N. B. Triplett, Waynesburg ....
62578		Hodgenville Roller Mills, Hodgenville
63074		Lancaster-Smith Seed Co., Owensboro.
62166	Red Fox Grain and Grass Grower	Manufacturer ....
62167	Fox Soil Builder	Manufacturer ....
62168	Fox High Grade Special	Manufacturer ....
62169	Fox Wheat and Grain Special	Manufacturer ....
62170	Fox Early Harvest	Manufacturer ....
62171	Early Harvest Tobacco Grower	
62579		M. L. Spurling, Campbellsville ......
62172	Fox Formula	Manufacturer ....
62173	Fox Crop and Tobacco Grower	Manufacturer ....
62174	Fox Wheat and Corn Manure	
62580		N. B. Triplett, Waynesburg ....
62581		Hodgenville Roller Mills, Hodgenville.
62175	Fox Tobacco Grower	Manufacturer ....
62176	Fox Wheat and Corn Grower	Manufacturer ....
62177	Fox Vegetable Grower	Manufacturer ....
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62194	Globe Good Grower Fertilizer	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN					POTASH			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number.
											62164
14.20	0.45	14.65				0.26	0.32		0.49	25.3	62576
12.15	2.20	14.35				0.33	0.40	0.48		23.3	63073
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*23.7*	
											62165
10.50	1.20	11.70				0.40	0.49	1.06		23.3	62577
10.30	0.30	10.60				0.45	0.55	1.08		23.0	62578
12.05	2.15	14.20				0.33	0.40	0.83		24.6	63074
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
14.05	8.00	22.05		0.81		0.81	0.98	0.88	0.62	36.0	62166
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
15.75	5.50	21.25		0.83		0.83	1.01	0.70	0.87	37.9	62167
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*28.0*	
14.50	4.70	19.20		0.86		0.86	1.04	0.72	5.28	53.7	62168
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*41.0*	
15.30	6.25	21.55		1.04		1.04	1.26	0.74	1.17	40.4	62169
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*29.3*	
12.95	9.60	22.55		1.12		1.12	1.36	0.80	1.52	40.4	62170
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62171
10.55	3.15	13.70	0.52		0.41	0.93	1.13	1.92		31.3	62579
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
11.10	9.30	20.40		1.64		1.64	1.99	0.88	2.51	45.4	62172
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*35.8*	
11.45	8.00	19.45		1.62		1.62	1.97	1.48	3.86	53.1	62173
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*35.3*	
											62174
6.90	*1.20*	8.10	0.86		0.55	1.41	1.71	1.93		28.4	62580
7.65	0.75	8.40	1.15		0.38	1.53	1.86	2.07		30.8	62581
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
11.30	10.60	21.90		2.12		2.12	2.57	1.78	0.74	46.1	62175
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
13.30	6.80	20.10		1.90	0.20	2.10	2.55	1.48	1.09	47.7	62176
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
10.85	8.90	19.75		2.15		2.15	2.61	1.38	4.49	58.4	62177
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*45.2*	
13.90	8.20	22.10		0.82		0.82	1.00	1.16		34.5	62194
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*23.7*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Globe Fertilizer Co.	
62195	Globe Blood, Bone Phosphate and Potash	
62588		W. E. Gravely, Brodhead
62589		Ed. L. Renfro, Horse Cave
62590		Reynolds & Burleson, Waynesburg
63076		Hutcheson Bros., Auburn
63077		W. E. Gravely, Brodhead
62196	Globe Grain and Grass Grower	
62907		Hafendorfer Thornton Co., Owensboro
62197	Globe Money-Maker	Manufacturer
62198	Globe High Grade Special	Manufacturer
62199	Globe Wheat and Grain Special	
62591		Ed. L. Renfro, Horse Cave
62908		E. L. & A. T. Byron, Owingsville
62200	Progress Corn and Wheat Grower	
63078		Vine Grove Feed Co., Vine Grove
63079		W. E. Gravely, Brodhead
62201	Progress Tobacco Grower	
62592		Vine Grove Feed Co., Vine Grove
62593		W. E. Gravely, Brodhead
62202	Braden Formula	
62594		Planters Hdw. Co., Hopkinsville
63080		Planters Hdw. Co., Hopkinsville
63081		W. E. Gravely, Brodhead
62203	Universal Crop and Tobacco Grower	
62595		Goodman Bros. Co., Shelbyville
62204	Eagle Wheat and Corn Grower	
62909		E. L. & A. T. Byron, Owingsville
63082		Moss & Gibson, Crestwood
63083		I. K. Miller & Sons, Campbellsville

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62195
12.75	2.00	14.75				0.43	0.52	1.03		27.1	62588
12.35	2.90	15.25				0.34	0.41	1.10		26.5	62589
11.35	3.30	14.65				0.44	0.53	1.22		26.3	62590
12.35	2.15	14.50				0.40	0.49	1.28		27.3	63076
12.80	1.55	14.35				0.35	0.42	1.36		27.7	63077
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
											62196
8.80	3.50	12.30	0.23		0.53	0.76	0.92	1.74		26.9	62907
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
15.75	5.50	21.25		0.83		0.83	1.01	0.70	0.87	37.9	62197
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*28.0*	
14.50	4.70	19.20		0.86		0.86	1.04	0.72	5.28	53.7	62198
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*41.0*	
											62199
13.25	2.10	15.35				0.78	0.95	0.97		30.1	62591
11.70	0.50	12.20		0.53	0.35	0.88	1.07	1.21		28.8	62908
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*29.3*	
											62200
10.20	1.30	11.50		0.28	0.30	0.58	0.70	1.96		27.7	63078
10.60	1.70	12.30		0.24	0.39	0.63	0.76	2.14		29.6	63079
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62201
10.75	0.55	11.30		0.32	0.52	0.84	1.02	2.14		30.8	62592
11.70	1.90	13.60	0.36		0.30	0.66	0.80	2.08		31.3	62593
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62202
12.00	1.45	13.45				0.92	1.12	2.30		34.2	62594
13.05	1.75	14.80				0.80	0.97	2.52		36.0	63080
11.70	1.40	13.10		0.38	0.29	0.67	0.81	3.22		35.7	63081
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*35.8*	
											62203
8.10	0.50	8.60		0.49	0.23	0.72	0.87	3.93		33.1	62595
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*35.3*	
											62204
7.95	0.50	8.45		1.25	0.30	1.55	1.88	2.33		32.3	62909
8.65	1.10	9.75				1.46	1.77	2.72		34.5	63082
7.85	1.40	9.25		0.70	0.68	1.38	1.68	2.15		30.6	63083
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Globe Fertilizer Co.	
62205	Big Four Tobacco Grower	
62596		A. T. Warder, Epworth ....
62597		I. K. Miller & Sons, Campbellsville ..
62206	Globe Wheat Grower	
63084		Hutcheson Bros., Auburn ....
62207	Ky. Standard Tobacco Maker	
62598		Ed. L. Renfro, Horse Cave ....
62599		Lee Kesler, Center ....
62910		Collins Hdw. Co., Frankfort ....
62208	Globe Soluble Vegetable Manure	
62911		E. L. & A. T. Byron, Owingsville ....
	Groves' Fertilizer Works (The Joslin-Schmidt Co.), Cincinnati, O.	
62765	Groves' Standard	
62914		Minges Hdw. Co., Newport ....
62915		J. F. Collings, Shepherdsville........
62768	Harvest King	
62916		Sturgis Implement Co., Sturgis ......
62917		Thomas & Dodd, Burtonville ....
62769	Economy Brand	
62918		J. F. Collings, Shepherdsville ....
63095		J. F. Collings, Shepherdsville ....
62774	Half and Half	
62924		J. C. Everett & Co., Maysville ....
63099		Frank Baker, Clarkson ....
63100		J. F. Collings, Shepherdsville ....
	Hall Seed Co., Inc., Louisville, Ky.	
62294	Halco Special Tobacco Grower	Manufacturer ....
62295	Halco Tobacco Grower	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN					POTASH			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number.
											62205
8.00	0.90	**8.90**	0.87		0.59	1.46	1.77	2.52		32.6	62596
8.35	0.45	**8.80**		1.11	0.46	1.57	1.91	2.24		32.7	62597
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
											62206
11.00	1.30	12.30		0.98	0.62	1.60	1.94	2.27		37.3	63084
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
											62207
11.20	1.70	12.90		0.22	1.41	1.63	1.98	1.90		36.4	62598
10.35	1.80	12.15	0.75		0.98	1.73	2.10	1.94		36.1	62599
10.35	0.55	**10.90**		0.97	0.45	1.42	1.72	2.36		**35.1**	62910
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
											62208
8.40	0.55	**8.95**		1.25	0.39	1.64	1.99	**3.56**		**38.5**	62911
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*45.2*	
											62765
11.95	1.95	13.90		0.58	0.76	1.34	1.63	**1.43**		**33.8**	62914
11.45	1.35	12.80		0.79	0.69	1.48	1.80	2.20		36.9	62915
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*2.00*		*35.0*	
											62768
7.75	0.75	8.50		0.31	0.34	0.65	0.79	0.95		24.3	62916
9.50	0.85	10.35		0.31	0.45	0.76	0.92	0.81		23.2	62917
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*22.1*	
											62769
11.60	0.90	12.50		0.28	0.46	0.74	0.90	0.69		25.7	62918
9.10	3.20	12 30		0.22	0.61	0.83	1.01	0.75		**23.7**	63095
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*25.1*	
											62774
12.30	5.20	17.50		1.14	0.34	1.48	1.80	2.05		39.1	62924
10.90	7.25	18.15		0.74	0.77	1.51	1.83	2.15		38.4	63099
9.95	6.90	16.85		0.52	1.00	1.52	1.85	2.14		36.9	63100
10.00	*6.00*	*16.00*				*1.65*	*2.00*	*2.00*		*37.0*	
8.90	2.50	11.40		0.45		0.45	0.55		1.14	22.1	62294
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*1.00*	*20.5*	
9.10	3.45	12.55		0.92		0.92	1.12		2.21	30.3	62295
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Hall Seed Co.	
62296	Halco Tobacco and Potato Grower	Manufacturer ....
	Hopkins Fertilizer Co., New Albany, Ind.	
60908	Superior	Manufacturer ....
60909	Kentucky Tobacco Grower	Manufacturer ....
60910	Tobacco Special	
62928		Harry Poland, Milton ....
60911	Potato and Tobacco Grower No. 1	Manufacturer ....
60916	Half and Half No. 1	Manufacturer ....
60917	Potato and Tobacco Grower	Manufacturer ....
60918	Wheat and Corn Grower No. 2	
62606		Conner-Hayden & Co., Bardstown ....
62931		John Estrage, Clarkson ....
63104		Conner-Hayden & Co., Bardstown ....
60919	High Grade Tobacco Grower	Manufacturer ....
60920	Tobacco Bed and Field Mixture	
62607		J. B. Carr, Campbellsburg ....
62364	Potato Grower	Manufacturer ....
62870	Blood, Bone and Phosphate	Manufacturer ....
	International Agr'l Corp., Inc., Cincinnati, O.	
60678	Buffalo Vegetable and Tobacco	
62608		S. Y. Cutshaw, Bedford ....
60679	Buffalo High Grade Tobacco Special	
62609		S. Y. Cutshaw, Bedford ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.65	1.45	12.10		1.26	0.54	1.80	2.19		2.96	41.0	62296
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*37.2*	
11.85	0.50	12.35		1.92	0.31	2.23	2.71	4.64		52.2	60908
10.00	*2.00*	*12.00*				*1.65*	*2.00*		*4.00*	*43.4*	
8.05	0.15	8.20		2.32		2.32	2.82	2.79		39.5	60909
6.00	*2.00*	*8.00*				*1.65*	*2.00*		*2.00*	*29.4*	
											60910
9.10	0.70	9.80	0.76			0.76	0.92	3.20		32.1	62928
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*3.00*	*30.5*	
11.80	0.40	12.20		1.07		1.07	1.30	1.82	1.82	39.9	60911
11.00	*2.00*	*13.00*				*0.82*	*1.00*		*2.00*	*31.0*	
12.50	2.70	15.20		1.85	0.39	2.24	2.72	1.08		39.8	60916
6.00	*7.00*	*13.00*				*1.65*	*2.00*		*1.00*	*27.4*	
13.55	0.25	13.80		1.08	0.33	1.41	1.71	0.76	0.54	35.5	60917
11.00	*2.00*	*13.00*				*0.82*	*1.00*		*1.00*	*27.0*	
											60918
11.40	0.30	11.70				0.47	0.57	1.22		25.4	62606
9.85	1.30	11.15				0.43	0.52		1.11	22.8	62931
10.50	1.10	11.60				0.34	0.41		0.84	21.9	63104
10.00	*2.00*	*12.00*				*0.41*	*0.50*		*1.00*	*22.7*	
10.50	0.35	10.85		0.77	0.30	1.07	1.30	1.34		28.7	60919
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*1.00*	*22.5*	
											60920
12.50	0.50	13.00		0.97	1.97	2.94	3.57	3.31		52.8	62607
10.00	*2.00*	*12.00*				*2.47*	*3.00*		*3.00*	*45.1*	
7.95	0.65	8.60		1.43	0.38	1.81	2.20	4.86		44.3	62364
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*3.00*	*36.4*	
7.80	0.50	8.30		1.91		1.91	2.32	3.03		37.4	62870
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*32.4*	
											60678
10.15	3.05	13.20				1.17	1.42	1.20	7.64	60.0	62608
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*8.00*	*51.3*	
											60679
11.90	2.40	14.30				1.73	2.10	1.40	2.54	46.7	62609
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*44.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	International Agr'l Corp.	
60680	Buffalo Tobacco and Corn Grower	
62610		S. Y. Cutshaw, Bedford
62611		Coffee & Vanhook, Moreland
60681	Buffalo Kentucky Standard	
62612		Coffee & Vanhook, Moreland
60682	Buffalo Corn and Grain Grower	Manufacturer
60683	Buffalo Complete Fertilizer	Manufacturer
60661	I. A. C. Potato and Tobacco Special	Manufacturer
60662	I. A. C. A-1 Tobacco Fertilizer	Manufacturer
60663	I. A. C. Truck and Tobacco Grower	Manufacturer
60664	I. A. C. Standard Fertilizer	
62617		G. W. Wheeler, Lewisburg
60665	I. A. C. Farmers' Favorite Manure	
62618		R. E. Newell, Maysville
62619		Tolesboro Supply Co., Tolesboro
62777		B. E. Williams, Stanford
60665	I. A. C. Farmers' Favorite Manure	
62620		C. M. Langdon, Science Hill
62621		J. W. Bratcher, Berea
63105		C. M. Langdon, Science Hill
63106		McKenzie & Herrin, Eubank
60667	I. A. C. Wheat and Corn Grower	Manufacturer
	The Jarecki Chemical Co. (Armour owned), Cincinnati, O. and Louisville, Ky.	
62302	Lake Erie Guano with Phosphate and Potash	
62627		Pleasureville Supply Co., Pleasureville

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											60680
10.00	2.70	12.70	0.28	0.20	0.98	1.46	1.77	2.29		35.5	62610
9.85	2.65	12.50	0.40	0.27	0.90	1.57	1.91	2.08		35.2	62611
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
											60681
11.45	1.35	12.80	0.27		0.61	0.88	1.07	2.86		35.3	62612
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*3.00*		*34.7*	
10.35	4.90	15.25				0.79	0.96	2.09		31.4	60682
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*2.00*		*27.7*	
10.30	4.80	15.10				0.84	1.02	1.37		28.7	60683
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*1.00*		*23.7*	
8.30	0.35	8.65	1.57		0.99	2.56	3.11	8.60		64.9	60661
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*54.9*	
8.60	2.40	11.00		0.22	1.28	1.50	1.82	7.76		55.4	60662
7.00	*4.00*	*11.00*				*1.65*	*2.00*		*5.00*	*43.7*	
11.75	3.15	14.90	1.22	0.35	0.88	2.45	2.97	1.45		41.8	60663
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*1.00*	*37.9*	
											60664
9.30	3.00	12.30				1.58	1.92	2.02		34.3	62617
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
											60665
11.30	2.70	14.00		0.25	0.89	1.14	1.38	3.50		40.0	62618
11.15	1.85	13.00				0.74	0.90	2.83		34.0	62619
11.55	1.15	12.70				0.99	1.20	2.72		35.6	62777
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*3.00*		*34.7*	
											60666
9.35	2.90	12.25	0.38	0.20	0.35	0.93	1.13	2.18		30.4	62620
9.90	3.00	12.90	0.50		0.39	0.89	1.08	1.99		30.2	62621
8.10	1.60	9.70		0.21	0.46	0.67	0.81	0.47		19.4	63105
8.75	3.00	11.75	0.49		0.45	0.94	1.14	1.94		28.7	63106
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*2.00*		*27.7*	
11.90	1.60	13.50		0.21	0.27	0.48	0.58	1.45		27.7	60667
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*25.4*	
											62302
14.55	1.55	16.10				0.65	0.79	0.54		29.2	62627
11.00	*1.00*	*12.00*				*0.82*	*1.00*	*1.00*		*26.6*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Jarecki Chemical Co.	
62303	Tobacco and Potato Food	
62933		Stuart & O'Brien, Paris
63111		C. L. & F. F. Dudley, Flemingsburg
62304	Number One Formula	
62934		Farmers Union Supply Co., Lawrenceburg
62305	Little Giant	
62628		C. L. & F. F. Dudley, Flemingsburg
63112		C. L. & F. F. Dudley, Flemingsburg
62306	Middle West Formula	
62316	Gilead Phosphate	
62317	Indian Br. Tobacco and Potato Fertilizer	
62630		I. K. Miller & Sons, Campbellsville
62935		Farmers' Union Supply Co., Lawrenceburg
62318	Fish Phosphate and Potash Tobacco and Potato Food	
62778	Lake Erie Guano with Phosphate and Potash	Manufacturer
62779	Number One Formula	Manufacturer
62780	Little Giant	Manufacturer
62781	Favorite Grain Grower	Manufacturer
62782	Sure Crop	Manufacturer
62783	Grain Grower	Manufacturer

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62303
8.50	1.70	10.20				0.80	0.97	2.40	1.12	33.1	62933
8.50	0.70	9.20				0.85	1.03	4.52		37.1	63111
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*34.1*	
											62304
8.60	2.10	10.70		0.46	0.75	1.21	1.47	2.00		30.2	62934
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*2.00*		*26.1*	
											62305
11.65	1.20	12.85				0.53	0.64	1.41		27.3	62628
10.90	1.20	12.10		0.27	0.62	0.89	1.08	1.24		28.0	63112
10.00	*1.00*	*11.00*				*0.41*	*0.50*	*1.00*		*22.3*	
											62306
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*38.0*	
											62316
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*22.1*	
											62317
10.55	0.85	11.40		1.39	1.05	2.44	2.96	2.83		44.6	62630
9.55	1.45	11.00		1.28	1.09	2.37	2.88	2.02	0.73	42.5	62935
9.00	*1.00*	*10.00*				*2.47*	*3.00*	*3.00*		*43.2*	
											62318
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*22.1*	
11.25	2.70	13.95		0.37	0.49	0.86	1.04	1.19		28.7	62778
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*28.1*	
10.25	2.55	12.80		0.29	0.50	0.79	0.96	2.30		31.1	62779
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*29.1*	
10.00	2.30	12.30		0.37	0.58	0.95	1.15	1.08		26.9	62780
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*25.1*	
8.55	1.25	9.80		0.66	0.26	0.92	1.12	1.28		24.9	62781
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*22.1*	
11.30	1.95	13.25		2.02		2.02	2.45	4.26		48.9	62782
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*43.0*	
8.40	2.35	10.75	0.70	0.25	0.74	1.69	2.05	2.15		34.0	62783
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*32.0*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Kaufman Fertilizer Co. (Armour owned), Cincinnati, O. and Louisville, Ky.	
62335	Corn, Wheat and Oats Grower	
62336	Tobacco and Potato Grower	
62631		Pleasureville Supply Co., Pleasureville
62337	Harvest King	
62338	Banner Crop Grower	
62339	Complete Ration	
62793	Corn, Wheat and Oats Grower	Manufacturer
62794	Harvest King	Manufacturer
62795	Banner Crop Grower	Manufacturer
62796	Favorite Grain Grower	Manufacturer
62797	Sure Crop	Manufacturer
62798	Grain Grower	Manufacturer
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62223	O. K. Special Mixture	
62632		Tye-Siler & Co., Corbin
62224	O. K. Grain Grower	
62633		Smith & Dawson, Shepherdsville
62634		Layman Bros., Princeton
63114		Smith & Dawson, Shepherdsville
62225	O. K. Corn, Wheat and Oats Grower	
62635		Thompson Fertilizer Co., Mt. Sterling
62936		D. L. D. Sandefur, Beaver Dam
63115		W. P. Hayes, Brodhead
63116		Guenther Hdw. Co., Owensboro

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN					POTASH			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number.
											62335
11.00	*1.00*	*12.00*				*0.82*	*1.00*	*1.00*		*26.6*	
											62336
8.50	0.90	9.40		0.29	0.66	0.95	1.15	1.36	3.15	37.8	62631
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*34.1*	
											62337
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*2.00*		*26.1*	
											62338
10.00	*1.00*	*11.00*				*0.41*	*0.50*	*1.00*		*22.3*	
											62339
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*38.0*	
11.25	2.70	13.95		0.37	0.49	0.86	1.04	1.19		28.7	62793
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*28.1*	
10.25	2.55	12.80		0.29	0.50	0.79	0.96	2.30		31.1	62794
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*29.1*	
10.00	2.30	12.30		0.37	0.58	0.95	1.15	1.08		26.9	62795
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*25.1*	
8.55	1.25	9.80		0.66	0.26	0.92	1.12	1.28		24.9	62796
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*22.1*	
11.30	1.95	13.25		2.02		2.02	2.45	4.26		48.9	62797
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*43.0*	
8.40	2.35	10.75	0.70	0.25	0.74	1.69	2.05	2.15		34.0	62798
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*32.0*	
											62223
11.70	4.00	15.70				0.42	0.51	0.48		23.3	62632
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*23.7*	
											62224
11.40	0.10	11.50				0.48	0.58	1.28		25.6	62633
12.30	1.60	13.90				0.39	0.47	1.06		26.1	62634
11.20	1.55	12.75				0.38	0.46	0.96		23.9	63114
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
											62225
11.35	0.65	12.00				0.46	0.56	0.96		24.4	62635
10.90	0.80	11.70				0.49	0.59	1.18		24.8	62936
10.95	3.05	14.00				0.50	0.61	1.32		26.4	63115
11.75	2.35	14.10				0.40	0.49	1.14		25.9	63116
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Ky. Fert. Co., Br. Federal Chem. Co.	
62226	O. K. Old Reliable	Manufacturer ....
62227	O. K. Special	Manufacturer ....
62228	O. K. Wheat and Grain Special	
62636		Thompson Fertilizer Co., Mt. Sterling
62229	O. K. Corn and Wheat Grower	Manufacturer ....
62230	O. K. Tobacco Fertilizer	
62637		Smith & Dawson, Shepherdsville .....
62937		V. B. Embry, Caneyville ....
62231	O. K. High Grade Mixture	Manufacturer ....
62232	O. K. Crop and Tobacco Grower	Manufacturer ....
62233	Golden Leaf Tobacco Grower	
62638		Layman Bros., Princeton ....
63117		Guenther Hdw. Co., Owensboro ......
62234	O. K. Tobacco and Vegetable Grower	Manufacturer ....
	Louisville Fertilizer Co. (Armour owned), Louisville, Ky., Nashville, Tenn., and Cincinnati, O.	
60791	High Grade Potato Grower	Manufacturer ....
60792	Special Crop Grower	
62645		Frank X. Merkley, Campbellsville ....
60793	Louisville Tobacco Grower	
62646		F. B. Henry & Sons, Carlisle ....
60797	Tobacco and Potato Grower	Manufacturer ....
60798	Slaughter House Bone	
62647		Miss M. Muster, E. Bernstadt ....
62648		M. B. Wallingford, Mt. Carmel ......

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
15.75	5.50	21.25		0.83		0.83	1.01	0.70	0.87	37.9	62226
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*28.0*	
14.50	4.70	19.20		0.86		0.86	1.04	0.72	5.28	53.7	62227
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*41.0*	
											62228
13.00		**13.00**	0.61		0.32	0.93	1.13	1.08		30.3	62636
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*29.3*	
12.95	9.60	22.55		1.12		1.12	1.36	0.80	1.52	40.4	62229
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62230
10.35	0.05	**10.40**		0.25	0.64	0.89	1.08	2.11		30.2	62637
10.75	0.65	**11.40**				0.75	0.91	2.40		31.2	62937
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
11.10	9.30	20.40		1.64		1.64	1.99	0.88	2.51	45.4	62231
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*35.8*	
11.45	8.00	19.45		1.62		1.62	1.97	1.48	3.86	53.1	62232
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*35.3*	
											62233
9.10	2.15	11.25				1.59	1.93	1.92		33.3	62638
9.05	2.40	11.45		0.84	0.71	1.55	1.88	2.37		34.9	63117
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
10.25	8.95	19.20		1.76		1.76	2.14	1.76	5.06	58.6	62234
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*6.00*	*46.2*	
9.85	2.85	12.70		0.51	0.39	0.90	1.09	0.82	2.15	34.1	60791
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*3.00*	*31.3*	
											60792
9.90	0.50	**10.40**	0.70	0.25	0.48	1.43	1.74	1.14		29.6	62645
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*26.3*	
											60793
11.40	0.60	12.00	0.24	0.27	0.48	0.99	1.20	0.68	1.45	32.8	62646
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
10.60	2.30	12.90		1.11	0.75	1.86	2.26	0.64	0.45	34.2	60797
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*1.00*	*29.2*	
											60798
10.20	0.20	10.40		0.91	0.68	1.59	1.93	2.27		35.6	62647
7.90	0.70	**8.60**		0.76	0.92	1.68	2.04	2.14		32.5	62648
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Co.	
60799	Big Tobacco Maker	
62649		W. T. Kirkman, Elkton ....
62938		Walter Young Coal Co., Owingsville ..
60800	Louisville Tobacco Grower Special	Manufacturer ....
60807	Special Tobacco Grower	
62655		F. L. Marshall, Lewisburg ....
62656		M. B. Wallingford, Mt. Carmel .....
63121		S. A. Browning, Vanceburg ....
60808	Blue Grass Tobacco Grower	
62657		Frank X. Merkley, Campbellsville ...
62658		M. C. Marion & Son, Elizabethtown ..
60809	Special Corn and Wheat Grower	
62659		F. B. Henry & Sons, Carlisle ....
62940		L. Stamper, Stanton ....
60810	Louisville Standard	
63225		F. X. Merkley, Campbellsville ......
60811	Royal Brand	
62660		W. T. Kirkman, Elkton ....
62941		Yopp Seed Co., Paducah ....
60812	Big Potato and Tobacco Maker	Manufacturer ....
60813	Plant Bed Special	Manufacturer ....
60814	Truck Grower	
62661		Miss M. Muster, E. Bernstadt ......
62662		M. B. Wallingford, Mt. Carmel ......
62801	Truck Gardeners' Pride	Manufacturer ....
62805	Purdue's Choice	Manufacturer ....
62809	Potato and Tobacco Maker	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											60799
9.35	0.65	10.00	0.86	0.32	0.52	1.70	2.06		3.53	40.3	62649
8.65	0.45	9.10	0.53	0.31	0.72	1.56	1.89	0.96	2.08	36.2	62938
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*4.00*	*41.2*	
12.55	1.75	14.30		1.08	0.79	1.87	2.27	0.68	0.62	37.8	60800
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*1.00*	*32.2*	
											60807
11.90	2.00	13.90		0.34	0.37	0.71	0.86		0.70	26.4	62655
9.95	0.50	10.45		0.25	0.22	0.47	0.57		0.58	20.7	62656
10.15	4.50	14.65		0.45		0.45	0.55	0.88		23.7	63121
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*1.00*	*20.5*	
											60808
9.05	0.55	9.60				0.54	0.66	1.38	1.13	27.6	62657
9.70	0.40	10.10				0.45	0.55		2.89	29.4	62658
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*3.00*	*28.5*	
											60809
9.20	0.75	9.95				1.31	1.59	1.13		27.8	62659
7.85	0.80	8.65	0.21		0.60	0.81	0.98	1.24		22.7	62940
7.00	*4.00*	*11.00*				*0.82*	*1.00*		*1.00*	*21.8*	
											60810
7.75	6.70	14.45		0.32	0.28	0.60	0.73	0.96		22.4	63225
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*1.00*	*23.3*	
											60811
10.00	1.00	11.00	0.53	0.76	0.63	1.92	2.33		2.59	39.2	62660
10.90	2.20	13.10		0.96	0.60	1.56	1.89	1.45		34.0	62941
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
9.35	2.45	11.80		0.84	1.87	2.71	3.29	1.84	1.17	46.0	60812
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*3.00*	*42.9*	
13.90	1.20	15.10		1.52	0.90	2.42	2.94	1.00	1.52	48.4	60813
12.00	*4.00*	*16.00*				*2.47*	*3.00*		*2.00*	*44.9*	
											60814
9.40	0.70	10.10	0.90	0.51	0.89	2.30	2.79	2.58		40.8	62661
6.75	0.50	7.25	0.71	0.62	0.77	2.10	2.55	2.87		36.5	62662
8.00	*4.00*	*12.00*				*3.29*	*4.00*		*3.00*	*48.6*	
9.80	4.40	14.20		2.58	0.99	3.57	4.33	0.90	2.23	54.0	62801
8.00	*4.00*	*12.00*				*3.29*	*4.00*	*3.00*		*48.6*	
14.05	1.90	15.95		1.76		1.76	2.14	6.42		59.8	62805
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*6.00*		*55.2*	
9.20	5.40	14.60		0.60	0.36	0.96	1.17		4.24	39.6	62809
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*35.3*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Co.	
62810	Stock Yard Guano	
63131		Yopp Seed Co., Paducah ....
63132		F. X. Merkley, Campbellsville ....
62811	Wheat, Corn and Oats	
63133		W. E. Ellis & Bro., Hartford ....
63134		F. X. Merkley, Campbellsville ......
62812	Tobacco and Tomato Grower	Manufacturer ....
62815	Grain Grower	
63135		H. E. Woodson, Brandenburg ....
63136		W. E. Ellis & Bro., Hartford ....
62816	Blood Phosphate and Bone	Manufacturer ....
62817	Golden Crop Grower	Manufacturer ....
62861	Guano	Manufacturer ....
63218	Wheat King	
63226		S. A. Browning, Vanceburg ....
	Morris & Co., Chicago, Ill.	
62441	Special Big Three—Manure and Potash	
62446	Big Eight—Ammoniated Acid Phosphate and Potash	
62447	Special Big Nine—Phosphated Manure and Potash	
62448	Big Ten—Grain Grower	
	Mt. Pleasant Fertilizer Co., Inc., Subsidiary of Va.-Car. Chem. Co., Mt. Pleasant, Tenn.	
62074	V-C Plant Food	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62810
8.55	9.40	17.95		0.52	0.29	0.81	0.98	1.51		28.3	63131
10.35	5.25	15.60		0.42	0.32	0.74	0.90	1.05		27.0	63132
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
											62811
11.60	2.55	14.15		0.46	0.41	0.87	1.06	1.34		29.9	63133
12.65	2.60	15.25		0.35	0.46	0.81	0.98	1.31		30.9	63134
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*1.00*		*28.5*	
10.60	4.30	14.90		0.67	0.34	1.01	1.23	0.76	1.40	33.3	62812
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62815
9.65	0.75	10.40		0.65	0.75	1.40	1.70	2.29		33.7	63135
9.60	3.00	12.60		0.63	0.49	1.12	1.36	1.78		30.6	63136
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*33.2*	
12.75	5.10	17.85		1.21	0.63	1.84	2.23	2.28		43.2	62816
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*39.2*	
10.10	2.45	12.55		1.22	0.53	1.75	2.12	4.43		46.1	62817
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*4.00*		*44.2*	
11.10	4.25	15.35		1.14	0.49	1.63	1.98	2.23		38.7	62861
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*2.00*		*36.2*	
											63218
9.35	0.45	9.80		0.25	0.20	0.45	0.55	1.32		22.6	63226
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*1.00*	*20.5*	
											62441
9.00						*0.82*	*1.00*		*3.00*	*31.2*	
											62446
8.00						*0.82*	*1.00*		*1.00*	*21.7*	
											62447
12.00	*1.00*	*13.00*				*0.82*	*1.00*		*1.00*	*28.1*	
											62448
8.00	*1.50*	*9.50*				*1.65*	*2.00*		*2.00*	*32.2*	
8.70	1.00	9.70				4.89	5.94		3.34	61.0	62074
8.00	*2.00*	*10.00*				*4.94*	*6.00*		*3.00*	*59.4*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Mt. Pleasant Fertilizer Co., Inc., Subsidiary of Va.-Car. Chem. Co.	
62079	Mt. Pleasant Special Tobacco Grower	
62672		C. C. Tatum, Russellville ....
62080	Mt. Pleasant Black Patch Tobacco Grower	
62673		C. C. Tatum, Russellville ....
62674		Orange & Davis, Princeton ....
62081	Mt. Pleasant H. Gr. Tobacco Grower	Manufacturer ....
62086	Mt. Pleasant Superior Burley Grower	Manufacturer ....
62087	Mt. Pleasant Burley Special	Manufacturer ....
62089	Mt. Pleasant Corn Grower	Manufacturer ....
62867	Grigsby's Special	
63139		Grigsby & Co., Bardstown ....
62965	Mt. Pleasant Wheat Grower	Manufacturer ....
62967	Black Patch Grain Grower	Manufacturer ....
	Price Chem. Co., Inc., Louisville, Ky.	
62045	Special Corn and Wheat Fertilizer	
62676		Shelby Middleton, Poplarville ....
62677		Johnson & Viers, Elizabethtown .....
63145		Jake Walters, Hodgenville ....
63146		H. J. Upchurch, Burnside ....
62046	Good Grain Grower	
62678		J. H. Carter, Glasgow ....
62047	Universal Crop Fertilizer	Manufacturer ....
62048	Walter Crady's Veg., Potato and Tobacco Special	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62079
8.10	6.50	14.60	1.63		0.26	1.89	2.29	1.37		33.5	62672
8.00	*2.00*	*10.00*				*1.23*	*1.50*		*1.50*	*27.4*	
											62080
9.10	8.80	17.90	0.43		0.22	0.65	0.79	0.62		24.2	62673
7.75	9.60	17.35	0.58			0.58	0.70	1.33		24.9	62674
7.00	*2.00*	*9.00*				*0.41*	*0.50*		*1.00*	*18.2*	
11.40	0.80	12.20	1.36		0.28	1.64	1.99	3.14		41.5	62081
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*3.00*	*36.4*	
11.60	1.40	13.00		1.28	0.32	1.60	1.94	2.17		37.8	62086
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*2.00*	*32.4*	
11.45	0.80	12.25	0.96			0.96	1.17	3.99		40.2	62087
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*4.00*	*34.5*	
10.95	7.20	18.15				0.50	0.61	1.24		27.8	62089
7.00	*2.00*	*9.00*				*0.41*	*0.50*		*1.00*	*18.2*	
											62867
13.25	3.70	16.95		0.49	0.33	0.82	1.00	1.21		31.9	63139
10.00	*2.00*	*12.00*				*0.82*	*1.00*		*1.00*	*25.5*	
10.20	6.90	17.10		0.94	0.35	1.29	1.57	1.63		33.6	62965
8.00	*2.00*	*10.00*				*1.23*	*1.50*		*1.50*	*27.4*	
9.20	10.80	20.00	0.49			0.49	0.59	1.04		25.7	62967
7.00	*2.00*	*9.00*				*0.41*	*0.50*		*1.00*	*18.2*	
											62045
12.80	2.05	14.85	0.21		0.37	0.58	0.70	0.68	0.41	28.4	62676
11.75	2.15	13.90	0.31		0.41	0.72	0.87		1.31	28.8	62677
13.25	3.20	16.45	0.27		0.45	0.72	0.87	0.62	0.75	31.7	63145
13.80	2.50	16.30	0.23		0.29	0.52	0.63		1.25	30.3	63146
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
											62046
12.25	1.95	14.20	0.28		0.23	0.51	0.62		0.50	24.7	62678
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*0.50*	*23.0*	
12.60	0.50	13.10	1.04			1.04	1.26	0.62	0.91	32.5	62047
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*29.3*	
12.70	0.40	13.10	1.00		0.24	1.24	1.51	1.28	1.50	39.0	62048
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*35.8*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Price Chemical Co.	
62049	Ky. Blue Grass Tobacco Special	
62679		S. Y. Cutshaw, Bedford ....
62680		Pleasureville Imp. Co., Pleasureville .
62050	High Grade Special	Manufacturer ....
62051	Extra High Gr. Tobacco Fertilizer	Manufacturer ....
62052	Old Time Grain Fertilizer	
62681		G. W. Collins, Columbia ....
63147		Jake Walters, Hodgenville ....
62053	Old Time Tobacco Fertilizer	
62944		Crofton-Mattick Co., Sanders ....
62945		G. M. Johnson, Hartford ....
62054	Truck and Tobacco Fertilizer	Manufacturer ....
62055	Bright Tobacco Special	Manufacturer ....
62056	General Crop Fertilizer	
63148		G. W. Richardson, Somerset ....
62057	One Ten One Fertilizer	
62682		Peoples Store, Loretto ....
	Rasin-Monumental Co., Subsidiary of Va.-Car. Chem. Co., Inc., Cin., O.	
62272	Rasin's Farmers' Success	
63160		J. H. Wyan, London ....
62273	Rasin's Reliable Wheat and Corn Fertilizer	Manufacturer ....
62274	Rasin's Big Giant Phosphate	
63161		C. E. Preston, Smith's Grove ....
62275	Rasin's General Favorite	Manufacturer ....
62276	Rasin's Sweepstakes Fertilizer	
63162		W. W. Durbin, Clarkson ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62049
9.60	1.10	10.70	0.90		0.48	1.38	1.68	1.16	2.88	40.7	62679
9.85	1.35	11.20	0.82		0.54	1.36	1.65	0.62	3.55	41.5	62680
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*4.00*	*38.2*	
12.25	0.30	12.55	0.86		0.51	1.37	1.66	0.98	1.06	36.3	62050
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
11.85	0.30	12.15	1.73			1.73	2.10	0.74	2.25	42.0	62051
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*44.2*	
											62052
9.85	1.95	11.80		0.88	0.65	1.53	1.86	1.68	0.42	34.7	62681
10.35	1.70	12.05	1.16		0.59	1.75	2.12		1.78	35.6	63147
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
											62053
8.20	1.60	9.80	0.85		0.74	1.59	1.93	1.08	0.90	32.0	62944
8.70	1.50	10.20	0.99		0.78	1.77	2.15	0.86	1.41	35.1	62945
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
12.00	1.25	13.25	2.14		0.39	2.53	3.07	0.76	2.74	50.2	62054
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*3.00*	*42.9*	
10.05	0.95	10.50	1.99			1.99	2.42	1.40	0.43	36.5	62055
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*30.7*	
											62056
12.10	2.60	14.70	0.58		0.33	0.91	1.10	1.65		32.2	63148
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											62057
11.75	2.20	13.95	0.84		0.48	1.32	1.60		1.07	32.0	62682
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*26.3*	
											62272
9.95	0.75	10.70	0.38		0.51	0.89	1.08	0.74	0.40	26.0	63160
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*1.00*		*22.3*	
10.25	0.70	10.95				0.94	1.14	0.94	1.14	30.6	62273
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*2.00*		*26.3*	
											62274
9.70	1.60	11.30	0.40		0.32	0.72	0.87	1.74	1.96	35.0	63161
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*3.00*		*30.3*	
10.35	1.80	12.15		0.93	1.52	2.45	2.97	2.76		44.4	62275
8.00	*1.50*	*9.50*				*1.65*	*2.00*	*2.00*		*32.2*	
											62276
14.15	1.15	15.30		1.44	0.49	1.93	2.34	0.98	1.61	45.6	63162
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*2.00*		*38.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Read Phosphate Co., Nashville, Tenn.	
60717	Corn, Wheat and Oat Grower	
62949		B. F. Beard & Co., Hardinsburg
63168		B. F. Beard & Co., Hardinsburg
60718	Kentucky Tobacco Grower	
62696		Barren County Gro. and Hdw. Co., Glasgow
62697		S. A. Browning, Vanceburg
60719	Standard Tobacco Grower	
62698		I. K. Miller & Sons, Campbellsville
62699		L. L. Freeman, Cadiz
60720	Blood and Bone No. 1	
63169		I. K. Miller & Sons, Campbellsville
60721	Kentucky Special	
62700		I. K. Miller & Sons, Campbellsville
63170		U. L. Antle, Columbia
60722	High Grade Tobacco Grower	
62701		W. B. Stinson, Elkton
60723	Blood and Bone Special	
62702		Hatcher & Rawls, Cerulean
60724	H. Gr. Ammoniated Dissolved Bone	Manufacturer
60725	Corn and Wheat Grower	Manufacturer
60726	Wheat and Clover Grower	Manufacturer
	The Smith Agr'l Chemical Co., Columbus, O.	
62438	Smith's Tobacco Grower	Manufacturer
	Smith Bros., New Albany, Ind.	
62042	Champion Tobacco and Potato Grower	
62951		J. T. Lawson, Greenup

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											60717
8.50	8.70	17.20	0.50		0.35	0.85	1.03	1.42		27.9	62949
7.75	6.00	13.75	0.50		0.66	1.16	1.41	1.88		29.7	63168
7.00	*10.00*	*17.00*				*0.82*	*1.00*	*1.00*		*24.2*	
											60718
9.15	4.80	13.95	0.25		0.71	0.96	1.17	1.16		27.0	62696
10.40	8.20	18.60				1.05	1.27	0.70		29.0	62697
8.00	*7.00*	*15.00*				*0.82*	*1.00*		*1.00*	*24.5*	
											60719
8.90	5.75	14.65		0.97	1.04	2.01	2.44	1.92		37.4	62698
9.85	2.25	12.10	0.62		1.18	1.80	2.19	2.75		39.3	62699
8.00	5.00	13.00				1.65	2.00		2.00	33.6	
											60720
8.50	2.90	11.40	1.14		0.74	1.88	2.28	2.19		35.8	63169
8.00	*5.00*	*13.00*				*1.65*	*2.00*	*2.00*		*33.6*	
											60721
8.15	8.85	17.00		0.45		0.45	0.55	3.74		33.9	62700
8.50	1.90	10.40				0.47	0.57	4.94		36.6	63170
8.00	*5.00*	*13.00*				*0.41*	*0.50*	*4.00*		*32.9*	
											60722
9.55	2.25	11.80				1.72	2.09	4.15		43.9	62701
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*4.00*	*41.6*	
											60723
10.65	2.55	13.20				0.92	1.12	1.16		28.1	62702
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*1.00*		*26.7*	
12.50	2.00	14.50		1.14	0.54	1.68	2.04	3.70		46.1	60724
10.00	*5.00*	*15.00*				*1.65*	*2.00*	*2.00*		*36.6*	
12.80	3.30	16.10	0.45		0.34	0.79	0.96	1.78		33.2	60725
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*25.4*	
12.90	2.30	15.20		0.90	0.31	1.21	1.47	2.71		39.6	60726
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*2.00*		*32.9*	
9.20	0.50	9.70	0.47		0.29	0.76	0.92	1.94		27.1	62438
8.00						*0.82*	*1.00*	*2.00*		*25.7*	
											62042
10.65	0.70	11.35		0.81	0.93	1.74	2.11	2.41		38.1	62951
10.00	*2.00*	*12.00*				*1.65*	*2.00*		*2.00*	*35.4*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Smith Bros.	
62043	Half and Half Mixture	
62706		R. M. Smith, Lagrange ....
63174		Jenkins-Essex Co., Elizabethtown ....
62044	Kentucky Tobacco Grower	
62707		R. M. Smith, Lagrange ....
62952		J. T. Lawson, Greenup ....
63216	Champion Crop Grower	
63233		R. M. Smith, Lagrange ....
	Southern Fertilizer Co., Inc., Louisville, Ky.	
62464	Elk Special Tobacco Grower	
62709		Ratliff Hdw. Co., Princeton ....
62710		Bush Coal Co., Winchester ....
63237	Elk Tobacco Grower	
63240		Bush Coal Co., Winchester ....
	St. Bernard Fertilizer Co., Nashville, Tenn.	
60759	Standard Tobacco Fertilizer	Manufacturer ....
60760	Farmers' Friend	Manufacturer ....
60761	Kentucky Plant Food	Manufacturer ....
60762	Wheat Grower	Manufacturer ....
60763	High Grade Special Manure	Manufacturer ....
60764	Wheat, Oats and Corn Special	Manufacturer ....
60771	High Grade Tobacco Fertilizer	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											62043
9.40	5.10	14.50		0.95	0.64	1.59	1.93	0.56	0.58	32.2	62706
10.20	4.25	14.45				1.84	2.23	1.48		35.8	63174
6.00	*7.00*	*13.00*				*1.65*	*2.00*		*1.00*	*27.4*	
											62044
8.70	1.40	10.10		1.41	0.39	1.80	2.19	4.21		43.1	62707
9.75	0.60	10.35		0.87	0.76	1.63	1.98	3.22	0.62	41.6	62952
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*4.00*	*40.4*	
											63216
10.80	2.45	13.25	0.76		1.07	1.83	2.22	0.94	1.35	39.2	63233
12.00	*2.00*	*14.00*				*1.65*	*2.00*		*2.00*	*38.4*	
											62464
11.05	1.50	12.55				0.40	0.49	0.99		23.9	62709
12.80	1.00	13.80	0.39	0.39	0.68	1.46	1.77	1.09		34.2	62710
10.00	*1.00*	*11.00*				*0.41*	*0.50*		*1.00*	*22.3*	
											63237
10.95	0.95	11.90				0.68	0.83	1.33		26.9	63240
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*1.00*	*28.0*	
9.40	5.60	15.00	1.36		0.40	1.76	2.14	2.77		39.7	60759
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*2.00*	*33.6*	
10.90	7.50	18.40		0.72	0.35	1.07	1.30	1.38		32.4	60760
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*1.00*		*23.7*	
9.40	5.00	14.40	0.33	0.58	0.20	1.11	1.35	4.94		43.6	60761
8.00	*5.00*	*13.00*				*0.41*	*0.50*	*4.00*		*32.9*	
10.95	1.55	12.50		0.37	0.69	1.06	1.29	1.30		29.7	60762
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*1.00*		*26.7*	
12.50	2.00	14.50		1.14	0.54	1.68	2.04	3.70		46.1	60763
10.00	*5.00*	*15.00*				*1.65*	*2.00*	*2.00*		*36.6*	
12.80	3.30	16.10	0.45		0.34	0.79	0.96	1.78		33.2	60764
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*25.4*	
11.05	5.70	16.75		1.49	0.31	1.80	2.19	4.71		50.3	60771
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*4.00*	*41.6*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Swift & Co., Inc., National Stock Yards, Ill.	
60772	Swift's Champion Wheat and Corn Grower	
62953		Isaac Shouse, Salt Lick ....
63175		Jno. B. Marriott, Cecilia ....
63176		W. E. Burress, Greensburg ....
60773	Swift's Special Grain Grower	Manufacturer ....
60774	Swift's Diamond "K" Grain Grower	
62954		W. W. Durbin, Clarkson ....
62955		Isaac Shouse, Salt Lick ....
63177		Jno. B. Marriott, Cecilia ....
60775	Swift's Diamond "B" Fertilizer	
62956		Chas. S. Brent & Bro., Paris ....
60776	Swift's Diamond "A" Fertilizer	Manufacturer ....
60777	Swift's Grain and Tobacco Grower	Manufacturer ....
60778	Swift's Complete Fertilizer	
62712		J. F. Collings, Shepherdsville ....
62713		F. M. Mitchell, Scottsville ....
63178		John B. Marriott, Cecilia ....
63179		W. E. Burress, Greensburg ....
60779	Swift's Superphosphate	
62714		John Gilbert, Franklin ....
60780	Swift's Diamond "W" Veg. and Tobacco Grower	
62715		W. E. Burress, Greensburg ....
62716		Ellis & Overstreet, Lagrange ....
60781	Swift's Diamond "W" Tob. Grower	
62717		W. E. Burress, Greensburg ....
62718		E. M. Ford & Sons, Cave City ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
											60772
12.85	2.40	15.25		0.90	0.59	1.49	1.81	1.70	0.53	39.6	62953
13.30	2.50	15.80		0.65	0.96	1.61	1.95	1.00	1.04	40.4	63175
13.20	3.40	16.60		1.00	0.61	1.61	1.95	1.08	0.92	40.4	63176
12.00	*3.00*	*15.00*				*1.65*	*2.00*	*2.00*		*38.8*	
10.50	2.85	13.35	0.74	0.34	0.56	1.64	1.99	3.17		41.3	60773
10.00	*3.00*	*13.00*				*1.65*	*2.00*	*2.00*		*35.8*	
											60774
13.35	1.05	14.40	0.21	0.46	0.32	0.99	1.20	1.04		31.5	62954
12.95	3.40	16.35		0.50	0.23	0.73	0.89	1.29		31.1	62955
13.45	2.95	16.40		0.86		0.86	1.04	1.31		32.6	63177
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*1.00*		*28.9*	
											60775
8.35	3.40	11.75	0.98	0.76	0.50	2.24	2.72	4.34		46.9	62956
8.00	*3.00*	*11.00*				*2.47*	*3.00*	*5.00*		*50.5*	
9.80	2.70	12.50	1.62	0.41	0.42	2.45	2.97	2.20	0.82	45.0	60776
8.00	*3.00*	*11.00*				*2.47*	*3.00*	*3.00*		*42.5*	
11.85	3.10	14.95	0.83	0.28	0.67	1.78	2.16	1.86	2.20	47.7	60777
10.00	*3.00*	*13.00*				*1.65*	*2.00*	*4.00*		*43.8*	
											60778
12.30	1.10	13.40		0.50	0.27	0.77	0.93	0.42	0.63	28.5	62712
9.40	3.40	12.80		0.52	0.29	0.81	0.98		1.05	25.3	62713
9.35	2.50	11.85		0.51	0.30	0.81	0.98	0.50	0.73	25.6	63178
9.00	2.40	11.40		0.49	0.34	0.83	1.01	0.85		23.7	63179
8.00	*3.00*	*11.00*				*0.82*	*1.00*	*1.00*		*22.9*	
											60779
10.10	3.10	13.20		0.90	0.75	1.65	2.00		1.97	35.8	62714
8.00	*3.00*	*11.00*				*1.65*	*2.00*	*2.00*		*32.8*	
											60780
9.55	3.80	13.35	0.36	0.72	0.52	1.60	1.94	1.34	1.67	39.1	62715
8.70	1.60	10.30	0.44	0.76	0.46	1.66	2.02	1.60	1.74	38.7	62716
8.00	*3.00*	*11.00*				*1.65*	*2.00*	*3.00*		*36.8*	
											60781
9.25	3.80	13.05	0.46	0.67	0.37	1.50	1.82	0.56	0.54	30.3	62717
8.50	3.55	12.05	0.35	0.79	0.39	1.53	1.86		1.26	29.9	62718
8.00	*3.00*	*11.00*				*1.65*	*2.00*	*1.00*		*28.8*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Tennessee Chemical Co. (Armour owned), Louisville, Ky.; Nashville, Tenn. and Cincinnati, O.	
60822	Ox McChesney's Tobacco Grower	Manufacturer ....
60823	Ox Dark Tobacco Grower	Manufacturer ....
60830	Ox Special Tobacco Grower	
62723		I. K. Miller & Sons, Campbellsville ..
62724		J. E. Sego & Sons, Munfordville .....
63186		J. J. Shaver & Co., Mayfield ....
60831	Ox Tankage Phosphate and Potash	
62725		W. F. Grainger, Franklin ....
62726		J. S. Duke, Crab Orchard ....
60832	Ox Special Corn and Wheat Grower	
62727		Pineville Produce Co., Pineville ......
62728		W. F. Grainger, Franklin ....
60833	Ox Louisville Standard	Manufacturer ....
60834	Ox Special Crop Grower	Manufacturer ....
60835	Ox Louisville Tobacco Grower	
62729		Shaw & Reynolds, Cave City ....
62730		Loretto Hdw. Co., Loretto ....
60837	Ox Tobacco and Potato Grower	
62731		Vine Grove Feed Co., Vine Grove ....
60838	Ox Slaughter House Bone	
62732		W. F. Grainger, Franklin ....
62733		Earl P. Withers, Stanford ....
63187		S. O. Moody, Auburn ....
60839	Ox Big Tobacco Maker	
62734		J. S. Duke, Crab Orchard ....
60841	Ox Louisville Tobacco Gr. Special	
62735		W. F. Grainger, Franklin ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
12.80	3.10	15.90				0.50	0.61	1.11		28.4	60822
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
11.60	2.90	14.50		0.77	0.70	1.47	1.78	0.58		31.2	60823
10.00	*4.00*	*14.00*				*1.23*	*1.50*		*0.50*	*27.2*	
											60830
10.80	0.70	11.50		0.22	0.27	0.49	0.59	1.12		24.4	62723
8.10	0.85	8.95	0.24		0.26	0.50	0.61	1.10		20.4	62724
11.60	3.65	15.25				0.27	0.33		0.38	22.3	63186
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*1.00*	*20.5*	
											60831
12.90	3.40	16.30		0.24	0.30	0.54	0.66		0.85	27.9	62725
12.85	1.10	13.95				0.37	0.45		0.79	25.5	62726
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*25.0*	
											60832
7.95	0.50	8.45		0.25	0.55	0.80	0.97	0.94		21.5	62727
11.85	3.40	15.25		0.20	0.31	0.51	0.62		0.95	26.5	62728
7.00	*4.00*	*11.00*				*0.82*	*1.00*		*1.00*	*21.8*	
9.25	3.50	12.75		0.49	0.46	0.95	1.15	1.02		26.0	60833
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*1.00*	*23.3*	
12.20	2.65	14.85		0.48	0.46	0.94	1.14	1.12		30.4	60834
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*26.3*	
											60835
9.10	5.30	14.40		0.27	0.26	0.53	0.64	0.92		23.2	62729
10.95	1.50	12.45		0.27	0.61	0.88	1.07	0.96	1.32	32.3	62730
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*30.3*	
											60837
8.70	1.10	9.80		0.84	0.49	1.33	1.61		0.90	26.4	62731
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*1.00*	*29.2*	
											60838
10.00	2.50	12.50	0.75	0.34	0.64	1.73	2.10		1.90	35.7	62732
8.95	1.60	10.55		0.86	0.78	1.64	1.99	2.13		34.1	62733
8.75	2.60	11.35		0.98	0.74	1.72	2.09	1.86		33.7	63187
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*33.2*	
											60839
10.10	0.90	11.00	0.47	0.81	0.62	1.90	2.31	1.36	2.05	42.5	62734
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*4.00*	*41.2*	
											60841
10.70	2.30	13.00	0.52	0.52	0.68	1.72	2.09	0.72	0.75	34.9	62735
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*1.00*	*32.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Tennessee Chemical Co.	
60842	Ox Special Tobacco Guano	Manufacturer ....
60843	Ox Truck Grower	Manufacturer ....
60844	Ox Plant Bed Special	Manufacturer ....
62835	Ox Champion	Manufacturer ....
62836	Ox Crop Grower	Manufacturer ....
62837	Ox Wheat, Corn and Oats	
63192		N. D. Tabor, Olive Hill ....
63193		J. S. Duke, Crab Orchard ....
62838	Ox Kentucky Colonel	Manufacturer ....
62841	Ox Beef, Blood and Bone	Manufacturer ....
62842	Ox High Grade Potato Grower	Manufacturer ....
62843	Ox Truck Grower	Manufacturer ....
62847	Ox Kentucky's Choice	Manufacturer ....
62862	Ox Guano	
62958		The T. J. Turley Co., Owensboro ....
63219	Ox Wheat King	Manufacturer ....
	Victor Guano Co., Nashville, Tenn.	
60745	Standard Tobacco Grower	
62959		Lambert Gresham Hdw. Co., Henderson
60746	Kentucky Home Guano	Manufacturer ....
60747	Kentucky Soil Food	Manufacturer ....
60748	Corn and Wheat Grower	Manufacturer ....
60749	High Grade Grain Guano	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.40	2.45	13.85		0.93	0.80	1.73	2.10	0.94	1.30	39.2	60842
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*36.2*	
9.35	2.45	11.80		0.84	1.87	2.71	3.29	1.84	1.17	46.0	60843
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*3.00*	*42.9*	
13.90	1.20	15.10		1.52	0.90	2.42	2.94	1.00	1.52	48.4	60844
12.00	*4.00*	*16.00*				*2.47*	*3.00*		*2.00*	*44.9*	
8.85	4.95	13.80		0.52	0.34	0.86	1.04	4.34		38.6	62835
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*4.00*		*35.3*	
11.00	4.50	15.50		0.51	0.35	0.86	1.04	0.40	0.76	29.0	62836
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*26.3*	
											62837
12.75	1.40	14.15		0.37	0.46	0.83	1.01	1.03		29.6	63192
12.85	0.30	13.15		0.38	0.48	0.86	1.04	0.97		29.3	63193
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*1.00*		*29.3*	
10.45	4.35	14.80		0.56	0.31	0.87	1.06	2.59		33.9	62838
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*2.00*		*30.3*	
13.30	4.45	17.75		1.22	0.64	1.86	2.26	0.50	1.70	43.6	62841
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*39.2*	
11.20	5.20	16.40		1.22	0.55	1.77	2.15		4.08	47.6	62842
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*44.2*	
9.10	4.50	13.60		2.42	1.06	3.48	4.22	3.73		54.7	62843
8.00	*4.00*	*12.00*				*3.29*	*4.00*	*3.00*		*48.6*	
13.50	1.95	15.45		1.21	0.57	1.78	2.16		6.40	59.1	62847
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*6.00*		*55.2*	
											62862
10.55	2.50	13.05	0.51	0.52	0.53	1.56	1.89	2.06		36.0	62958
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*2.00*		*36.2*	
11.05	3.45	14.50				0.37	0.45	0.57		22.8	63219
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*1.00*	*20.5*	
											60745
9.65	3.00	12.65	0.54		1.14	1.68	2.04		2.02	35.5	62959
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*2.00*	*33.6*	
10.90	7.50	18.40		0.72	0.35	1.07	1.30	1.38		32.4	60746
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*1.00*		*23.7*	
9.40	5.00	14.40	0.33	0.58	0.20	1.11	1.35	4.94		43.6	60747
8.00	*5.00*	*13.00*				*0.41*	*0.50*	*4.00*		*32.9*	
10.95	1.55	12.50		0.37	0.69	1.06	1.29	1.30		29.7	60748
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*1.00*		*26.7*	
12.50	2.00	14.50		1.14	0.54	1.68	2.04	3.70		46.1	60749
10.00	*5.00*	*15.00*				*1.65*	*2.00*	*2.00*		*36.6*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Victor Guano Co.	
60750	Wheat, Oat and Corn Grower	Manufacturer
60751	Complete Grain Guano	
62742		L. F. Hubble, Somerset
60758	High Grade Tobacco Guano	Manufacturer
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.	
62254	V-C Complete Manure	
63200		J. D. Ashcraft, Irvington
62255	V-C Champion Corn and Wheat Gr.	
62748		Silas Shelburn, Lexington
62749		A. L. Moore, Leitchfield
62256	V-C Farmers' Friend	
62750		Estes & Hines, Science Hill
62751		Taylor Co. Supply Co., Campbellsville.
62257	V-C Beef, Blood and Bone B. B. B.	
62752		Taylor Co. Supply Co., Campbellsville
63201		J. D. Ashcraft, Irvington
62258	V-C Springfall Fertilizer	Manufacturer
62260	V-C Gem Fertilizer for Tobacco	
62755		Mt. Sterling Commission and Storage Co., Mt. Sterling
62756		Silas Shelburn, Lexington
62262	V-C Plant Food for Vegetable, Lawns and Flowers	Manufacturer
	Wood, Stubbs and Co. Store, Inc., Louisville, Ky.	
62066	Acme Potato and Tobacco Grower	Manufacturer
62067	Acme Special Potato Grower	Manufacturer

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
12.80	3.30	16.10	0.45		0.34	0.79	0.96	1.78		33.2	60756
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*25.4*	
											60751
13.40	2.55	15.95		0.26	0.56	0.82	1.00	1.60		33.5	62742
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*2.00*		*32.9*	
11.05	5.70	16.75		1.49	0.31	1.80	2.19	4.71		50.3	60758
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*4.00*	*41.6*	
											62254
8.90	1.15	10.05	0.35		0.49	0.84	1.02	0.82	0.45	24.8	63200
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*1.00*		*22.3*	
											62255
9.35	1.20	10.55		0.48	0.34	0.82	1.00	0.82	1.55	29.7	62748
10.05	1.40	11.45		0.59	0.36	0.95	1.15	0.84	1.74	32.6	62749
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*2.00*		*26.3*	
											62256
8.65	1.85	10.50		0.61	0.47	1.08	1.31	1.42	2.61	37.4	62750
9.05	1.85	10.90		0.56	0.35	0.91	1.10	0.98	2.43	34.3	62751
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*3.00*		*30.3*	
											62257
10.60	1.80	12.40		1.06	0.75	1.81	2.20	1.62	0.90	39.4	62752
10.20	1.20	11.40	0.27	0.81	0.73	1.81	2.20	1.46	0.76	37.3	63201
8.00	*1.50*	*9.50*				*1.65*	*2.00*	*2.00*		*32.2*	
13.50	0.25	13.75		1.40	0.34	1.74	2.11	0.88	1.23	41.0	62258
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*2.00*		*38.2*	
											62260
10.90	1.40	12.30		1.00	0.81	1.81	2.20	1.40		35.2	62755
10.65	1.50	12.15		1.05	0.77	1.82	2.21	0.84	0.45	34.5	62756
9.00	*1.50*	*10.50*				*1.65*	*2.00*		*1.00*	*29.7*	
11.05	1.10	12.15		4.82	1.29	6.11	7.42	3.03		71.9	62262
8.00	*1.50*	*9.50*				*4.94*	*6.00*	*3.00*		*59.2*	
8.30	0.50	8.80	1.28	0.28	0.53	2.09	2.54	0.70	1.16	34.7	62066
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*2.00*	*27.3*	
8.95	0.15	9.10	2.76			2.76	3.35	1.10	2.31	46.5	62067
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*37.2*	

Table I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Wood, Stubbs and Co.	
62068	Acme Wheat and Corn Grower	Manufacturer ....
62072	Acme Three Eight Five	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.50	0.50	11.00	0.54		0.20	0.74	0.90	0.52	0.71	26.1	62068
10.00	*4.00*	*14.00*				*0.41*	*0.50*		*1.00*	*23.5*	
9.70	1.35	11.05	1.38		1.27	2.65	3.22	1.40	3.84	54.6	62072
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*5.00*	*50.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Am. Agr. Chemical Co., Inc., Cin. Sales Dept., Cincinnati, O.	
60926	A. A. C. Ground Bone	
62469		L. B. Sievers & Son, Somerset ....
62470		Woodson Lewis, Greensburg ....
62979		D. Sanders, McKinney ....
62980		O. A. Lutes & Co., Shepherdsville ....
	Armour Fertilizer Works, Louisville, Ky.; Nashville, Tenn., and Cincinnati, O.	
60877	Armour's Big Crop Bone Meal	
62531		I. K. Miller & Sons, Campbellsville ..
63013		Cayce-Yost Co., Hopkinsville ....
60878	Armour's Big Crop Spl. Bone Meal	
62532		D. M. Brakefield, Adairville ....
60879	Armour's Big Crop Raw Bone	
62533		Ed. Allen & Co., Smith's Grove ......
63014		Frank Orr & Co., Elkton ....
63015		McLean Co. Hdw. Co., Calhoun ......
62828	Armour's Big Crop Bone Meal	
63029		Frank Henry, Center ....
63030		Thurman & Enlow, Hodgenville ......
62860	Armour's Big Crop Ky. Bone Meal	Manufacturer ....
60896	Tuscarora Bone Meal	Manufacturer ....
60897	Tuscarora Raw Bone	Manufacturer ....
	Calumet Fertilizer Co., New Albany, Ind.	
62404	Calumet Br. Bone Meal, Tankage and Potash	Manufacturer ....
62406	Calumet Br. Extra Am. Bone Meal	Manufacturer ....

BONES, TANKAGE, &c.

PERCENTAGE OF FINENESS		Total Phosphoric Acid	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Fine Bone	Medium Bone					From Muriate	From Sulfate		
									60926
71	29	30.10	65.74	1.95	2.37			37.7	62469
79	21	29.10	63.56	1.99	2.42			37.2	62470
82	18	30.60	66.83	1.66	2.02			36.1	62979
64	36	29.20	63.78	1.71	2.08			35.3	62980
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
									60877
73	27	26.55	57.98	2.92	3.54			41.7	62531
76	24	26.75	58.42	2.34	2.84			37.8	63013
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
									60878
78	22	26.90	58.76	2.83	3.44			41.3	62532
		24.00	*52.42*	*2.47*	*3.00*			*36.5*	
									60879
100		23.50	51.33	3.88	4.71			46.1	62533
100		23.60	51.55	4.08	4.95			47.4	63014
100		23.65	51.66	3.95	4.80			46.6	63015
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									62828
74	26	28.70	62.68	2.06	2.50			37.4	63029
78	22	27.90	60.94	2.49	3.02			39.8	63030
		24.00	*52.42*	*2.47*	*3.00*			*36.5*	
86	14	27.95	61.05	2.54	3.08			40.1	62860
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
70	30	28.55	62.36	2.15	2.61			37.9	60896
		24.00	*52.42*	*2.47*	*3.00*			*36.5*	
100		23.85	52.08	4.21	5.11			48.6	60897
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
89	11	19.90	43.46	2.14	2.60		1.75	37.9	62404
		16.00	*34.95*	*1.23*	*1.50*		*1.00*	*25.4*	
77	23	32.25	70.44	2.42	2.94			42.7	62406
		28.00	*61.16*	*2.00*	*2.43*			*36.4*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Calumet Fertilizer Co.	
62407	Calumet Br. Special Pure Bone Meal	
63040		A. W. Tarter, Columbia
62408	Calumet Br. Raw Bone Meal	
63041		Harvey Stout, Fern Creek
	The Cincinnati Phosphate Co. (Armour owned), Cincinnati, O.	
62333	Bone Meal	
62334	Raw Bone	
	Consolidated Chemical Co., Louisville, Ky.	
62853	Camel Brand Raw Bone	
63051		Zula Mill Co., Burnside
62854	Camel Brand Steamed Bone	
63052		E. M. Haynes, Franklin
	Duncan & Sherley, Lagrange, Ky.	
62463	Tiger Br. Raw Bone Meal	
62556		Manufacturer's warehouse
63056		Manufacturer's warehouse
	The Evansville Packing Co., Evansville, Ind.	
62289	Pure Raw Bone Meal	Manufacturer
	Federal Chemical Co., Inc., Louisville, Ky.	
62115	Pure Bone	
62567		Frank Orr & Co., Elkton
62568		Planters Hardware Co., Hopkinsville.
63063		Guenther Hdw. Co., Owensboro

BONES, TANKAGE, &C.

PERCENTAGE OF FINENESS		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Fine Bone	Medium Bone					From Muriate	From Sulfate		
									62407
100		34.70	75.77	0.85	1.03			33.7	63040
		30.00	*65.52*	*0.82*	*1.00*			*29.7*	
									62408
55	45	22.95	50.12	3.79	4.60			44.9	63041
		20.00	*43.67*	*3.71*	*4.50*			*42.0*	
									62333
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
									62334
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									62853
78	22	18.50	40.40	3.54	4.30			39.6	63051
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									62854
69	31	35.10	76.67	0.69	0.84			32.9	63052
		30.00	*65.52*	*1.03*	*1.25*			*31.2*	
									62463
100		23.30	50.88	3.65	4.43			44.2	62556
42	58	23.10	50.46	3.87	4.70			45.6	63056
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
55	45	27.90	60.94	3.43	4.16			46.3	62289
		23.00	*50.24*	*3.71*	*4.50*			*44.4*	
									62115
100		20.40	44.56	1.79	2.17			28.2	62567
100		23.15	50.56	1.62	1.97			30.2	62568
100		20.90	45.65	1.41	1.71			26.6	63063
		30.00	*65.52*	*1.03*	*1.25*			*31.2*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co., Inc.	
62142	Daybreak Raw Bone	
62574		A. W. Tarter, Columbia ....
62163	1st Prize Raw Bone	Manufacturer ....
	Fox Chemical Co., Br., Federal Chem. Co., Inc., Louisville, Ky.	
62191	Fox Raw Bone	Manufacturer ....
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62222	Globe Raw Bone	Manufacturer ....
	Groves Fert. Works (The Joslin-Schmidt Co.), Cincinnati, O.	
62356	Two Twenty-seven Bone	
62913		Minges Hardware Co., Newport ......
	Hall Seed Co., Inc., Louisville, Ky.	
62298	Halco Bone Meal	Manufacturer ....
62299	Halco Raw Bone	Manufacturer ....
	Hopkins Fert. Co., New Albany, Ind.	
63214	Pure Raw Bone	
63211		J. O. Duncan, Crestwood ....
63210		J. O. Duncan, Crestwood ....
	International Agr'l Corp., Inc. Cincinnati, O.	
62764	Buffalo Special Bone and Phosphate	Manufacturer ....
60676	I. A. C. Pure Ground Bone	
63110		C. M. Langdon, Science Hill ....
60677	I. A. C. Special Wheat Fertilizer	Manufacturer ....

BONES, TANKAGE, &C.

PERCENTAGE OF FINENESS		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Fine Bone	Medium Bone					From Muriate	From Sulfate		
									62142
70	30	19.70	43.03	3.86	4.69			42.8	62574
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
56	44	21.50	46.95	4.12	5.00			46.0	62163
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
56	44	21.50	46.95	4.12	5.00			46.0	62191
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
56	44	21.50	46.95	4.12	5.00			46.0	62222
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									62356
74	26	26.20	57.22	1.64	1.99			32.4	62913
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
72	28	26.60	58.09	2.22	2.70			36.8	62298
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
100		24.80	54.17	3.93	4.77			47.4	62299
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									63214
82	18	20.80	45.43	3.95	4.80			44.3	63211
83	17	17.50	38.22	3.81	4.63			40.7	63210
		21.50	*46.95*	*3.50*	*4.25*			*41.7*	
90	10	23.30	50.88	0.72	0.87			23.7	62764
		22.00	*48.06*	*0.82*	*1.00*			*23.3*	
									60676
85	15	27.75	60.60	2.40	2.91			39.0	63110
		22.00	*48.06*	*2.47*	*3.00*			*34.9*	
100		23.15	50.55	0.80	0.97			24.1	60677
		22.00	*48.06*	*0.82*	*1.00*			*23.3*	

Table II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Jarecki Chemical Co. (Armour owned), Cincinnati, O.	
62315	Bone Meal	
62319	Raw Bone	
	The Kaufman Fert. Co. (Armour owned), Cincinnati, O.	
62348	Bone Meal	
62349	Raw Bone	
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62246	O. K. Raw Bone	
63204		P. N. Fox & Son, Mt. Washington ...
	Louisville Fert. Co. (Armour owned), Louisville, Ky., Nashville, Tenn., and Cincinnati, O.	
60816	Bone Meal	
62663		Miss M. Muster, E. Bernstadt ....
62664		Hill Hardware Co., Bowling Green ...
63124		Hill Hardware Co., Bowling Green ...
60817	Kentucky Bone Meal	
63125		Yopp Seed Co., Paducah ....
60818	Raw Bone	
63126		F. X. Merkley, Campbellsville ....
	Morris & Co., Chicago, Ill.	
62439	Big One—Ground Raw Bone	
62440	Big Two—Steamed Bone	
63142		Farmers' Union Supply Co., Franklin.
62444	Special Big Six—Special Bone Meal and Potash	

BONES, TANKAGE, &c.

PERCENTAGE OF FINENESS		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Fine Bone	Medium Bone					From Muriate	From Sulfate		
									62315
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
									62319
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									62348
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
									62349
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									62246
74	26	17.50	38.22	3.88	4.71			41.2	63204
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									60816
75	25	26.05	56.89	3.15	3.82			42.9	62663
75	25	26.20	57.22	3.09	3.75			42.6	62664
86	14	28.40	62.03	2.55	3.10			40.6	63124
		24.00	*52.42*	*2.47*	*3.00*			*36.5*	
									60817
76	24	26.55	57.98	2.29	2.78			37.3	63125
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
									60818
100		25.10	54.82	3.87	4.70			47.2	63126
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
									62439
		24.00	*52.42*	*3.71*	*4.50*			*45.2*	
									62440
71	29	31.30	68.35	1.80	2.19			37.6	63142
		28.00	*61.16*	*2.06*	*2.50*			*36.8*	
									62444
		16.00	*34.95*	*0.82*	*1.00*		*3.00*	*30.5*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Morris & Co.	
62445	Special Big Seven—Sp'l Bone Meal	
63141		Farmers' Union Supply Co., Franklin.
	Mt. Pleasant Fert. Co., Inc., Subsidiary of Va.-Car. Chem. Co., Mt. Pleasant, Tenn.	
62760	Mt. Pleasant Half and Half	
62943		T. H. O'Bryan, Dawson Springs
	New Louisville Rendering Co., Inc., Louisville, Ky.	
62365	Pure Animal Matter Meat, Bones and Blood	
63229		Larue Co. Farm Bureau, Hodgenville.
62366	Pure Bone Meal	
63228		Larue Co. Farm Bureau, Hodgenville.
	Price Chemical Co., Inc., Louisville, Ky.	
62851	Raw Bone	
63153		H. J. Upchurch, Burnside
63154		Jake Walters, Hodgenville
62852	Steamed Bone	
63155		Jake Walters, Hodgenville
63221	Ground Bone	
63231		Mayhew & Gilbert, Franklin
	Read Phosphate Co., Nashville, Tenn.	
62352	Read's Pure Raw Bone Meal	
63172		Barren Co. Grocery & Hdw. Co., Glasgow

Bones, Tankage, &c.

Percentage of Fineness		Total Phosphoric Acid	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	Potash		Index of Relative Value	Station Number
Fine Bone	Medium Bone					From Muriate	From Sulfate		
78	22	21.15	46.18	1.23	1.49			25.5	62445 63141
		22.00	*48.06*	*0.82*	*1.00*			*23.3*	
100		22.30	48.70	2.02	2.45			32.0	62760 62943
		20.00	*43.67*	*1.65*	*2.00*			*27.6*	
78	22	10.20	22.27	4.04	4.90			36.4	62365 63229
		10.00	*21.85*	*4.00*	*4.86*			*36.0*	
80	20	22.65	49.46	2.36	2.87			34.6	62366 63228
		22.00	*48.06*	*3.50*	*4.25*			*42.1*	
87	13	17.90	39.09	3.74	4.54			40.5	62851 63153
89	11	18.50	40.40	3.71	4.50			40.8	63154
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
76	24	34.65	75.67	0.79	0.96			33.3	62852 63155
		30.00	*65.52*	*1.03*	*1.25*			*31.2*	
100		21.40	46.74	2.84	3.45			37.0	63221 63231
		24.00	*52.42*	*2.88*	*3.50*			*39.4*	
61	39	23.90	52.19	3.88	4.71			46.3	62352 63172
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Smith Bros., New Albany, Ind.	
63215	Pure Raw Bone	
63234		R. M. Smith, Lagrange
	Southern Fertilizer Co., Inc., Louisville, Ky.	
62864	Elk Bone Meal	Manufacturer
62865	Elk Raw Bone	Manufacturer
	Swift & Co., Inc., National Stock Yards, Ill.	
60789	Swift's 2¼-29 Bone Meal Fertilizer	Manufacturer
60790	Swift's Raw Bone Meal Fertilizer	Manufacturer
63238	Swift's Ground Beef Bone Fertilizer	
63241		Johnson & Bogess, Greenville
	Taylor & Powell Fertilizer Co., Springfield, Tenn.	
62462	Half and Half	Manufacturer
	Tenn. Chem. Co. (Armour owned), Louisville, Ky., Nashville, Tenn., and Cincinnati, O.	
60846	Ox Bone Meal	
63188		W. F. Grainger, Franklin
60847	Ox Kentucky Bone Meal	
63189		S. O. Moody, Auburn
60848	Ox Raw Bone	
63190		W. F. Grainger, Franklin

Bones, Tankage, &c.

Percentage of Fineness		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	Potash		Index of Relative Value	Station Number
Fine Bone	Medium Bone					From Muriate	From Sulfate		
59	41	27.10	59.18	3.36	4.08			45.2	63215 63234
		21.50	*46.95*	*3.50*	*4.25*			*41.7*	
71	29	28.10	61.35	2.37	2.88			39.07	62864
		24.00	*52.42*	*2.47*	*3.00*			*36.5*	
100		25.50	55.68	4.01	4.87			48.47	62865
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	
80	20	29.60	64.65	2.10	2.55			38.4	60789
		29.00	*63.34*	*1.85*	*2.25*			*36.2*	
83	17	24.00	52.42	3.79	4.60			45.7	60790
		23.00	*50.24*	*3.71*	*4.50*			*44.4*	
100		28.85	63.00	2.46	2.99			40.3	63238 63241
		27.00	*58.96*	*2.06*	*2.50*			*36.0*	
70	30	27.15	59.29	2.21	2.68			37.2	62462
		20.00	*43.67*	*1.65*	*2.00*			*27.6*	
78	22	27.50	60.07	2.80	3.40			41.6	60846 63188
		24.00	*52.42*	*2.47*	*3.00*			*36.5*	
84	16	27.10	59.18	2.04	2.48			36.0	60847 63189
		27.00	*58.96*	*1.65*	*2.00*			*33.2*	
100		24.50	53.51	3.90	4.73			46.9	60848 63190
		22.00	*48.06*	*3.71*	*4.50*			*43.6*	

Table II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.	
62263	V-C Raw Bone Meal	
62451		W. I. West, Monticello ....
62452		W. I. West, Monticello ....
63202		C. E. Preston, Smith's Grove ....
62264	V-C Pure Bone Meal	
63203		Taylor County Supply Co., Campbellsville ....
63222	V-C Steamed Bone	
63235		C. E. Preston, Smith's Grove ....
	Wood, Stubbs & Co. Store, Inc., Louisville, Ky.	
62868	Acme Bone Meal	Manufacturer ....
62869	Acme Half and Half	Manufacturer ....

Bones, Tankage, &c.

Percentage of Fineness		Total Phosphoric Acid	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	Potash		Index of Relative Value	Station Number
Fine Bone	Medium Bone					From Muriate	From Sulfate		
									62263
76	24	22.10	48.26	3.21	3.90			40.2	62451
76	24	22.55	49.26	2.94	3.57			38.6	62452
64	36	20.85	45.54	3.74	4.54			42.9	63202
		20.00	*43.67*	*3.71*	*4.50*			*42.0*	
									62264
90	10	22.30	48.70	2.40	2.91			34.6	63203
		22.00	*48.06*	*2.47*	*3.00*			*34.9*	
									63222
89	11	21.70	47.39	2.59	3.14			35.5	63235
		23.00	*50.24*	*2.47*	*3.00*			*35.7*	
45	55	22.35	48.81	5.03	6.11			53.1	62868
		30.00	*65.52*	*1.03*	*1.25*			*31.2*	
67	33	22.70	49.58	2.06	2.50			32.6	62869
		20.00	*43.67*	*1.65*	*2.00*			*27.6*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	A. D. Adair & McCarty Bros., Inc., Atlanta, Ga.						
62361	Adair's High Grade Dissolved Bone No. 16	Manufacturer	18.05	0.90	18.95	21.7	62361
			16.00			*19.2*	
	The Am. Agr'l Chem. Co., Inc., Cin. Sales Dept., Cincinnati, O.						
60930	Bowker's 10% Acid Phosphate						60930
62871		Carson Nash, Providence	12.50	2.30	14.80	13.00	62871
			10.00	*2.00*	*12.00*	*12.0*	
60931	Bowker's Soluble Bone						60931
62471		Gooch & Payne, Eubank	15.75	1.60	17.35	18.9	62471
			14.00	*2.00*	*16.00*	*16.8*	
60932	Bowker's 16% Acid Phosphate						60932
62472		Estes & Hines, Science Hill	17.20	1.30	18.50	20.6	62472
62473		John Gilbert, Franklin	18.05	0.65	18.70	21.7	62473
62981		C. E. Preston, Smith's Grove	18.70	1.50	20.20	22.4	62981
62982		T. E. Richardson, Campbellsville	18.65	0.95	19.60	22.4	62982
			16.00	*2.00*	*18.00*	*19.2*	
60948	Bradley's 10% Acid Phosphate	Manufacturer	11.40	0.75	12.15	13.7	60948
			10.00	*2.00*	*12.00*	*12.0*	
60949	Bradley's Soluble Dissolved Bone	Manufacturer	14.80	1.70	16.50	17.8	60949
			14.00	*2.00*	*16.00*	*16.8*	
60950	Bradley's 16% Acid Phosphate	Manufacturer	17.00	1.20	18.20	20.4	60950
			16.00	*2.00*	*18.00*	*19.2*	
60964	Cleveland Dryer Works Horsehead Phosphate						60964
62875		O. A. Lutes & Co., Shepherdsville	12.00	2.70	14.70	14.4	62875
			10.00	*2.00*	*12.00*	*12.0*	

60965	Cleveland Dryer Works XXX Superphosphate						60965
62483		H. D. Penn, Mannsville	16.00	1.45	17.45	19.2	62483
62876		Amos Roberts, Hawesville	16.95	2.10	19.05	20.3	62876
62988		H. T. Simpson, Caneyville	15.70	1.20	16.90	18.8	62988
			14.00	*2.00*	*16.00*	*16.8*	
60966	Cleveland Dryer Works 16% Acid Phosphate						60966
62484		H. D. Penn, Mannsville	18.55	0.65	19.20	22.3	62484
62877		Amos Roberts, Hawesville	18.80	1.10	19.90	22.6	62877
62989		H. T. Simpson, Caneyville	18.60	0.85	19.45	22.3	62989
			16.00	*2.00*	*18.00*	*19.2*	
60980	Michigan Carbon Works 10% Acid Phosphate	Manufacturer	11.40	0.75	12.15	13.7	60980
			10.00	*2.00*	*12.00*	*12.0*	
60981	Red Line Phosphate						60981
62486		J. E. Hilliard, Fredonia	17.10	0.90	18.00	20.5	62486
			14.00	*2.00*	*16.00*	*16.8*	
60982	Michigan Carbon Works 16% Acid Phosphate						60982
62487		J. C. Everett & Co., Maysville	17.80	1.15	18.95	21.4	62487
62488		Albert Long, Scottsville	17.45	1.25	18.70	20.9	62488
62990		Vine Grove Feed Co., Vine Grove	18.30	1.00	19.30	22.0	62990
62991		J. C. Everett & Co., Maysville	18.70	1.00	19.70	22.4	62991
			16.00	*2.00*	*18.00*	*19.2*	
62001	N-W Horseshoe Brand Quick Acting Phosphate						62001
62502		Woodson Lewis, Greensburg	11.95	1.40	13.35	14.3	62502
62883		Frank Baker, Clarkson	11.80	2.30	14.10	14.2	62883
			10.00	*2.00*	*12.00*	*12.0*	
62002	N-W Horseshoe Br. Square Deal Phosphate						62002
62503		Woodson Lewis, Greensburg	15.85	1.55	17.40	19.0	62503
62504		John R. Nelson, Eubank	15.25	1.65	16.90	18.3	62504
			14.00	*2.00*	*16.00*	*16.8*	

TABLE III.—ACID PHOSPHATES.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID			Index of Relative Value	Station Number
			Available	Insoluble	Total		
	American Ag. Chem. Co.						
62003	N-W Horseshoe Br. 16% Acid Phosphate						62003
62505		Dickey & Co., Glasgow	18.75	0.65	19.40	22.5	62505
62506		F. H. Gordon, Richmond	17.75	1.20	18.95	21.3	62506
63006		Geo. W. Hill & Co., Covington	19.30	0.40	19.70	23.2	63006
			16.00	*2.00*	*18.00*	*19.2*	
62020	Packer's Boar's Head Br. Soluble Phosphate	Manufacturer	11.40	0.75	12.15	13.7	62020
			10.00	*2.00*	*12.00*	*12.0*	
62021	Packers Boar's Head Br. Gilt Edge Phosphate	Manufacturer	14.80	1.70	16.50	17.8	62021
			14.00	*2.00*	*16.00*	*16.8*	
62022	Packers Boar's Head Br. 16% Acid Phosphate	Manufacturer	17.00	1.20	18.20	20.4	62022
			16.00	*2.00*	*18.00*	*19.2*	
	Armour Fertilizer Works, Louisville, Ky., Nashville, Tenn., and Cincinnati, O.						
60880	Armour's Cereal Phosphate						60880
62889		S. Skaggs, Clarkson	11.10	0.50	11.60	13.3	62889
			10.00	*2.00*	*12.00*	*12.0*	
60881	Armour's Big Crop Star Phosphate						60881
62534		Sam Terry, Big Clifty	15.25	0.45	15.70	18.3	62534
62535		Rector Bros., Lewisburg	14.80	2.00	16.80	17.8	62535
			14.00	*2.00*	*16.00*	*16.8*	
60882	Armour's Big Crop H. Gr. Phosphate						60882
62536		M. T. Jasper & Son, Mintonville	16.25	1.10	17.35	19.5	62536
62537		Barren Co. Grocery and Hdw. Co., Glasgow	16.90	1.15	18.05	20.3	62537

62890		Cadiz Hdw. Co., Cadiz	17.00	0.90	17.90	20.4	62890
63016		Cayce-Yost Co., Hopkinsville	17.95	0.90	18.85	21.5	63016
			16.00	*2.00*	*18.00*	*19.2*	
60902	Ideal Super Phosphate						60902
62891		The T. J. Turley Co., Owensboro	16.75	0.80	17.55	20.1	62891
63017		The T. J. Turley Co., Owensboro	16.65	1.65	18.30	20.0	63017
			16.00	*2.00*	*18.00*	*19.2*	
62829	Armour's Big Crop 16%						62829
63031		Norris & Lockett Co., Henderson	16.35	1.45	17.80	19.6	63031
63032		Lebanon Carriage and Implement Co., Lebanon	18.30	0.30	18.60	22.0	63032
			16.00	*2.00*	*18.00*	*19.2*	
62830	Armour's Big Crop 20%	Manufacturer	22.60	0.90	23.50	27.1	62830
			20.00	*2.00*	*22.00*	*24.0*	
60898	Tuscarora Phosphate	Manufacturer	13.10	3.50	16.60	15.7	60898
			12.00	*2.00*	*14.00*	*14.4*	
60899	Tuscarora Acid Phosphate						60899
62544		J. R. Davis & Bro., Campbellsville.	14.35	0.40	14.75	17.2	62544
			14.00	*2.00*	*16.00*	*16.8*	
60900	Tuscarora High Grade Phosphate	Manufacturer	16.55	3.30	19.85	19.9	60900
			16.00	*2.00*	*18.00*	*19.2*	
	The C. S. Brent Seed Co., Inc., Lexington, Ky.						
62763	Brent's Acid Phosphate	Manufacturer	16.85	1.35	18.20	20.2	62763
			16.00			*19.2*	
	Calumet Fertilizer Co., New Albany, Ind.						
62401	Calumet Br. Acid Phosphate						62401
62897		Walter Spears, Moreland	17.10	0.40	17.50	20.5	62897
			14.00	*1.00*	*15.00*	*16.8*	
62402	Calumet Br. Acid Phosphate	Manufacturer	17.00	0.80	17.80	20.4	62402
			16.00	*2.00*	*18.00*	*19.2*	
	The Cincinnati Phosphate Co. (Armour owned), Cincinnati, O.						
62330	Acid Phosphate						62330
			16.00	*1.00*	*17.00*	*19.2*	
62331	Wheat Grower						62331
			14.00	*2.00*	*16.00*	*16.8*	

TABLE III.—ACID PHOSPHATES.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Phosphoric Acid: Available	Phosphoric Acid: Insoluble	Phosphoric Acid: Total	Index of Relative Value	Station Number
	Consolidated Chem. Co., Louisville, Ky.						
60707	Camel Br. High Grade Phosphate						60707
62552		Ky. Feed & Grain Co., Middlesboro	18.05	0.90	18.95	25.7	62552
62553		Horton Bros., Bethesda	18.65	0.50	19.15	22.4	62553
63049		J. W. Sweeney, Waynesburg	18.55	1.55	20.10	22.3	63049
63050		E. M. Haynes, Franklin	18.40	1.45	19.85	22.1	63050
			16.00	*2.00*	*18.00*	*19.2*	
60708	Camel Brand Acid Phosphate	Manufacturer	15.05	0.50	15.55	18.1	60708
			14.00	*2.00*	*16.00*	*16.8*	
62192	Beck Creek Farmers Club Acid Phosphate						62192
62554		Beck Creek Farmers' Club. Parker	18.60	0.90	19.50	22.3	62554
			16.00	*2.00*	*18.00*	*19.2*	
	Duncan & Sherley, Lagrange, Ky.						
62457	Tiger Brand Phosphate						62457
62901		Manufacturer's warehouse	17.05	1.35	18.40	20.5	62901
63055		Manufacturer's warehouse	18.40	0.90	19.30	22.1	63055
			16.00	*2.00*	*18.00*	*19.2*	
	The Empire Guano Co., Nashville, Tenn.						
60742	High Grade Acid Phosphate	Manufacturer	15.90	4.85	20.75	19.1	60742
			14.00	*4.00*	*18.00*	*16.8*	
60743	Climax Acid Phosphate						60743
62557		Allen County Farm Bureau, Scottsville	18.05	1.70	19.75	21.7	62557
62558		Skaggs Bros. & Co., Vanceburg ...	17.85	1.85	19.70	21.4	62558
			16.00	*2.00*	*18.00*	*19.2*	

	The Evansville Packing Co., Evansville, Ind.						
62279	High Grade Soluble Phosphate						62279
62559		Eldred Hardware Co., Princeton ..	16.70	0.25	16.95	20.0	62559
63057		Eldred Hardware Co., Princeton ..	17.40	0.30	17.70	20.9	63057
			16.00			*19.2*	
	Federal Chemical Co., Inc., Louisville, Ky.						
62114	Extra High Grade Phosphate	Manufacturer	19.00	0.45	19.45	22.8	62114
			18.00	*2.00*	*20.00*	*21.6*	
62138	Daybreak High Grade Phosphate						62138
62572		Terrell Bros., Bedford	16.20	0.70	16.90	19.4	62572
62573		Farmers' Union Supply Co., Russellville	17.45	1.60	19.05	20.9	62573
63069		A. W. Tarter, Columbia	16.85	1.00	17.85	20.2	63069
63070		Broadway Coal Co., Mayfield	18.35	1.50	19.85	22.0	63070
			16.00	*2.00*	*18.00*	*19.2*	
62139	Daybreak Royal Phosphate						62139
63071		A. W. Tarter, Columbia	15.95	2.00	17.95	19.1	63071
			14.00	*2.00*	*16.00*	*16.8*	
62140	Daybreak Standard Phosphate	Manufacturer	14.35	8.75	23.10	17.2	62140
			12.00	*2.00*	*14.00*	*14.4*	
62141	Daybreak Special Phosphate Mixture	Manufacturer	14.45	9.65	24.10	17.3	62141
			10.00	*10.00*	*20.00*	*12.0*	
62370	Blue Bull Phosphate	Manufacturer	19.10	0.65	19.75	22.9	62370
			16.00			*19.2*	
62159	1st Prize High Grade Phosphate						62159
62906		Taylor Cherry, Clarkson	16.40	0.30	16.70	19.7	62906
			16.00	*2.00*	*18.00*	*19.2*	
62160	1st Prize Phosphate	Manufacturer	16.15	5.50	21.65	19.4	62160
			14.00	*2.00*	*16.00*	*16.8*	
62161	1st Prize Standard Phosphate	Manufacturer	14.35	8.75	23.10	17.2	62161
			12.00	*2.00*	*14.00*	*14.4*	
62162	1st Prize Special Phosphate Mixture	Manufacturer	14.45	9.65	24.10	17.3	62162
			10.00	*10.00*	*20.00*	*12.0*	

TABLE III.—ACID PHOSPHATES.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Phosphoric Acid			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	Fox Chem. Co. Br. Federal Chem. Co., Inc., Louisville, Ky.						
62187	Fox High Grade Phosphate						62187
62585		N. B. Triplett, Waynesburg	16.25	0.35	16.60	19.5	62585
62586		K. J. McKinney, Brodhead	17.45	1.50	18.95	20.9	62586
63075		Lancaster-Smith Seed Co., Owensboro	16.45	1.60	18.05	19.7	63075
			16.00	*2.00*	*18.00*	*19.2*	
62188	Fox Phosphate						62188
62587		M. L. Spurling, Campbellsville ...	14.35	4.10	18.45	17.2	62587
			14.00	*2.00*	*16.00*	*16.8*	
62189	Fox Standard Phosphate ..	Manufacturer	14.35	8.75	23.10	17.2	62189
			12.00	*2.00*	*14.00*	*14.4*	
62190	Fox Special Phosphate Mixture	Manufacturer	14.45	9.65	24.10	17.3	62190
			10.00	*10.00*	*20.00*	*12.0*	
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.						
62218	Globe High Grade Phosphate						62218
62603		Reynolds & Burleson, Waynesburg.	17.25	2.15	19.40	20.7	62603
62604		Farmers' Union Supply Co., Bowling Green	18.50	1.40	19.90	22.2	62604
63091		I. K. Miller & Sons, Campbellsville	17.60	0.30	17.90	21.1	63091
63092		Pearson & Breedlove, Franklin ...	19.10	1.20	20.30	22.9	63092
			16.00	*2.00*	*18.00*	*19.2*	
62219	Globe Phosphate						62219
62912		W. S. Gains, Fordsville	15.70	0.30	16.00	18.8	62912
			14.00	*2.00*	*16.00*	*16.8*	
62220	Globe Standard Phosphate						62220
63093		I. K. Miller & Sons, Campbellsville	13.95	0.50	14.45	16.7	63093
			12.00	*2.00*	*14.00*	*14.4*	

62221	Globe Special Phosphate Mixture	Manufacturer	14.45	9.65	24.10	17.3	62221
			10.00	*10.00*	*20.00*	*12.0*	
	Groves Fertilizer Works (The Joslin-Schmidt Co.), Cincinnati, O.						
62772	16% Acid Phosphate						62772
62922		Banks Taylor, Caneyville	18.10	1.15	19.25	21.7	62922
62923		Thomas & Todd, Burtonville	17.85	0.90	18.75	21.4	62923
63097		J. K. Layman, Caneyville	17.65	1.00	18.65	21.2	63097
			16.00	*1.00*	*17.00*	*19.2*	
62773	Monarch Brand						62773
63098		J. K. Layman, Caneyville	14.80	1.20	16.00	17.8	63098
			14.00	*1.00*	*15.00*	*16.8*	
	Hall Seed Co., Inc., Louisville, Ky.						
62290	Halco Acid Phosphate	Manufacturer	17.50	1.85	19.35	21.0	62290
			16.00	*2.00*	*18.00*	*19.2*	
	Herbert Stone and Fertilizer Co., Nashville, Tenn.						
62353	High Grade Acid Phosphate	Manufacturer	19.55	0.10	19.65	23.5	62353
			16.00			*19.2*	
62354	Basic Slag						62354
62605		Allen County Farm Bureau, Scottsville			18.80	22.6	62605
					18.00	*21.6*	
	Hopkins Fertilizer Co., New Albany, Ind.						
60914	High Grade Acid Phosphate						60914
62930		John Estrage, Clarkson	15.25	0.65	15.90	18.3	62930
			14.00	*1.00*	*15.00*	*16.8*	
60915	Climax Acid Phosphate						60915
62374		Experiment Station Farm, Lexington	19.30	0.35	19.65	23.2	62374
63103		Conner, Hayden & Co., Bardstown	17.15	3.20	20.35	20.6	63103
			16.00	*1.00*	*17.00*	*19.2*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	International Agr'l Corp., Inc., Cincinnati, O.						
60688	Buffalo 18% Acid Phosphate						60688
62615		C. M. Langdon, Science Hill	19.65	1.15	20.80	23.6	62615
			18.00	*1.00*	*19.00*	*21.6*	
60689	Buffalo 16% Acid Phosphate						60689
62616		C. M. Langdon, Science Hill	18.00	2.30	20.30	21.6	62616
			16.00	*2.00*	*18.00*	*19.2*	
60673	I. A. C. Extra High Grade Acid Phosphate						60673
62622		J. W. Bratcher, Berea	18.60	1.00	19.60	22.3	62622
62623		Tolesboro Supply Co., Tolesboro...	20.00	0.80	20.80	24.0	62623
			18.00	*1.00*	*19.00*	*21.6*	
60674	I. A. C. Standard Acid Phosphate						60674
62624		J. W. Bratcher, Berea	18.05	1.90	19.95	21.7	62624
62625		C. M. Langdon, Science Hill	18.15	2.05	20.20	21.8	62625
63108		McKenzie & Herrin, Eubank	19.45	1.05	20.50	23.3	63108
			16.00	*2.00*	*18.00*	*19.2*	
60675	I. A. C. Dissolved Phosphate						60675
62626		C. M. Langdon, Science Hill	15.95	2.75	18.70	19.1	62626
63109		McKenzie & Herrin, Eubank	16.75	4.10	20.85	20.1	63109
			14.00	*2.00*	*16.00*	*16.8*	
	International Agr'l Corp., Florence, Ala.						
62193	International Acid Phosphate	Manufacturer	18.90	0.25	19.15	22.7	62193
			16.00	*1.00*	*17.00*	*19.2*	
	The Jarecki Chem. Co. (Armour owned), Cincinnati, O.						
62312	Acid Phosphate						62312

63113		C. L. and F. F. Dudley, Flemingsburg	15.60	0.45	16.05	18.7	63113
			16.00	*1.00*	*17.00*	*19.2*	
62313	C. O. D. Phosphate						62313
			14.00	*1.00*	*15.00*	*16.8*	
	Jefferson Agr'l Chem. Corp., Subsidiary of F. S. Royster Guano Co., Birmingham, Ala.						
62371	Jefferson High Grade Acid Phosphate	Manufacturer	20.20	0.50	20.70	24.2	62371
			16.00			*19.2*	
	The Kaufman Fertilizer Co. (Armour owned), Cincinnati, O.						
62345	Acid Phosphate						62345
			16.00	*1.00*	*17.00*	*19.2*	
62346	Dissolved Phosphate						62346
			14.00	*1.00*	*15.00*	*16.8*	
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.						
62242	O K. High Grade Phosphate						62242
62640		Layman Bros., Princeton	18.25	1.75	20.00	21.9	62640
62641		T. G. Moren, London	18.05	0.30	18.35	21.7	62641
63118		Guenther Hardware Co., Owensboro	17.55	1.50	19.05	21.1	63118
63119		T. G. Moren, London	15.55	1.45	17.00	18.7	63119
			16.00	*2.00*	*18.00*	*19.2*	
62243	O. K. Phosphate						62243
62642		T. N. Noe, Mt. Vernon	14.90	2.95	17.85	17.9	62642
62643		Cowherd & Durham, Greensburg	16.35	1.80	18.15	19.6	62643
			14.00	*2.00*	*16.00*	*16.8*	
62244	O. K. Standard Phosphate						62244
62644		Smith & Dawson, Shepherdsville	13.10	0.30	13.40	15.7	62644
63120		Smith & Dawson, Shepherdsville	11.80	1.05	12.85	14.2	63120
			12.00	*2.00*	*14.00*	*14.4*	
62245	O. K. Special Phosphate Mixture	Manufacturer	14.45	9.65	24.10	17.3	62245
			10.00	*10.00*	*20.00*	*12.0*	

Table III.—Acid Phosphates.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Phosphoric Acid: Available	Phosphoric Acid: Insoluble	Phosphoric Acid: Total	Index of Relative Value	Station Number.
	Louisville Fertilizer Co. (Armour owned), Louisville, Ky., Nashville, Tenn., and Cincinnati, O.						
60819	High Grade Dissolved Bone						60819
62665		M. B. Wallingford, Mt. Carmel ...	15.00	0.45	15.45	18.0	62665
62666		M. C. Marion & Son, Elizabethtown	14.40	0.30	14.70	17.3	62666
62942		C. A. Cohen, Greenville	15.05	2.40	17.45	18.1	62942
63127		Ratliff Hardware Co., Princeton ..	13.70	2.65	16.35	16.4	63127
			14.00	*2.00*	*16.00*	*16.8*	
60820	Tenn. Best Acid Phosphate						60820
62667		G. W. Jones, Williamsburg	16.85	0.15	17.00	19.2	62667
62668		E. M. Ford & Sons, Cave City	17.65	1.00	18.65	21.2	62668
			16.00	*2.00*	*18.00*	*19.2*	
60821	Eagle Acid Phosphate						60821
62669		Ratliff Hardware Co., Princeton ...	12.30	2.00	14.30	14.8	62669
			10.00	*2.00*	*12.00*	*12.0*	
62802	Sixteen per cent						62802
63128		S. Caudill, Morehead	17.00	1.50	18.50	20.4	63128
63129		G. H. Harris, Cloverport	16.65	0.40	17.05	20.0	63129
			16.00	*2.00*	*18.00*	*19.2*	
62803	Twenty per cent						62803
63130		Yopp Seed Co., Paducah	21.35	0.60	21.95	25.6	63130
			20.00	*2.00*	*22.00*	*24.0*	
63217	Bear Brand						63217
63227		Louis Cohen, Central City	16.65	2.65	19.30	20.0	63227
			14.00	*2.00*	*16.00*	*16.8*	
	Morris & Co., Chicago, Ill.						
63236	Big Brand Acid Phosphate						63236
63239		Farmers' Union Supply Co., Franklin	16.50	1.00	17.50	19.8	63239
			16.00			*19.2*	

	Mt. Pleasant Fert. Co., Inc., Subsidiary of Va.-Car. Chem. Co., Mt. Pleasant, Tenn.						
62075	Mt. Pleasant Big Winner Acid Phosphate						62075
62670		Farmers' Union Supply Co., Franklin	17.25	0.65	17.90	20.7	62670
62671		Grigsby & Co., Bardstown	16.85	1.80	18.65	20.2	62671
63137		R. M. Snow, Mayfield	18.55	0.55	19.10	22.3	63137
63138		Grigsby & Co., Bardstown	18.40	0.50	18.90	22.1	63138
			16.00	*2.00*	*18.00*	*19.2*	
62076	Black Patch Mt. Pleasant Special Acid Phosphate	Manufacturer	15.75	2.05	17.80	18.9	62076
			14.00	*2.00*	*16.00*	*16.8*	
62077	Black Patch Mt. Pleasant Soluble Bone	Manufacturer	14.80	3.40	18.20	17.8	62077
			12.00	*2.00*	*14.00*	*14.4*	
62078	Mt. Pleasant Acid Phosphate	Manufacturer	13.10	5.30	18.40	15.6	62078
			10.00	*2.00*	*12.00*	*12.0*	
	Peerless Chem. Co., Columbia, Tenn.						
62866	Peerless Acid Phosphate						62866
62971		West Ky. Coal Co., Sturgis	16.55	3.25	19.80	19.9	62971
62975		John R. Spencer, Marion	18.45	2.55	21.00	22.1	62975
62979		J. H. Baughman, Stanford	17.25	3.15	20.40	20.7	62979
63143		Smith & Reynolds, Slaughters	17.35	3.60	20.95	20.8	63143
63144		Marion Milling Co., Marion	17.50	4.25	21.75	21.0	63144
63207		W. B. Stinson, Elkton	14.25	4.50	18.75	17.1	63207
			16.00	*1.00*	*17.00*	*19.2*	
	Price Chem. Co., Inc., Louisville, Ky.						
62064	High Grade Phosphate						62064
62686		Jake Walters, Hodgenville	19.90	0.30	20.20	23.9	62686
62687		Shelby Middleton, Poplarville	19.60		19.60	23.5	62687
63151		First Ky. Dist. Supply Co., Glasgow	18.25	1.55	19.80	21.9	63151
63152		Cowherd & Durham, Greensburg	18.05	1.70	19.75	21.7	63152
			16.00	*2.00*	*18.00*	*19.2*	
62065	Acid Phosphate						62065
62947		L. F. Cowan & Son, Fredonia	13.90	2.55	16.45	16.7	62947
			14.00	*2.00*	*16.00*	*16.8*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID Available	PHOSPHORIC ACID Insoluble	PHOSPHORIC ACID Total	Index of Relative Value	Station Number.
	Rasin Monumental Co., Subsidiary of Va.-Car. Chem. Co., Inc., Cincinnati, O.						
62265	Rasin's 14% Acid Phosphate	Manufacturer	16.45	0.70	17.15	19.7	62265
			14.00	*1.50*	*15.50*	*16.8*	
62266	Rasin's 16% Acid Phosphate						62266
62688		Lessenberry & Jones, Glasgow	17.90	0.20	18.10	21.5	62688
62948		W. W. Durbin, Clarkson	17.60	0.70	18.30	21.1	62948
63156		W. W. Durbin, Clarkson	17.80	0.90	18.70	21.4	63156
63157		C. E. Preston, Smith's Grove	17.05	0.70	17.75	20.5	63157
			16.00	*1.50*	*17.50*	*19.2*	
62267	Rasin's 20% Acid Phosphate						62267
63158		W. W. Durbin, Clarkson	23.30	0.75	24.05	28.0	63158
			20.00	*1.50*	*21.50*	*24.0*	
	Read Phosphate Co., Nashville, Tenn.						
60711	XXX Dissolved Bone						60711
62690		Hatcher & Rawls, Cerulean	18.60	2.00	20.60	22.3	62690
			12.00	*6.00*	*18.00*	*14.4*	
60712	High Grade Acid Phosphate						60712
62691		Lester, Crawford & Baugh, Science Hill	17.00	2.00	19.00	20.4	62691
63164		Hollingsworth-Young Hdw. Co., Bowling Green	18.30	2.60	20.90	22.0	63164
			14.00	*4.00*	*18.00*	*16.8*	
60713	Special High Grade Acid Phosphate						60713
62692		J. W. Bratcher, Berea	16.90	3.15	20.05	20.3	62692
62693		Lester, Crawford & Baugh, Science Hill	17.45	3.15	20.60	20.9	62693
63165		Cowherd & Durham, Greensburg ..	17.70	2.80	20.50	21.2	63165
63166		B. F. Beard & Co., Hardinsburg ..	18.35	2.65	21.00	22.0	63166
			16.00	*2.00*	*18.00*	*19.2*	

	The Smith Agr'l Chem. Co., Columbus, O.						
62437	Smith's 16% Acid Phosphate	Manufacturer	16.90	0.50	17.40	20.3	62437
			16.00			*19.2*	
	Smith Bros., New Albany, Ind.						
62038	Acid Phosphate						62038
62703		R. M. Smith, Lagrange	17.65	2.65	20.30	21.2	62703
			16.00	*1.00*	*17.00*	*19.2*	
	Southern Fertilizer Co., Inc., Louisville, Ky.						
62367	Atlas Phosphate						62367
62708		Ratliff Hardware Co., Princeton	17.00	1.20	18.20	20.4	62708
			16.00	*1.00*	*17.00*	*19.2*	
62863	Elk Superior Phosphate	Manufacturer	24.40	0.30	24.70	29.28	62863
			20.00	*1.00*	*21.00*	*24.0*	
	St. Bernard Fertilizer Co., Nashville, Tenn.						
60769	High Grade Acid Phosphate	Manufacturer	15.90	4.85	20.75	19.1	60769
			14.00	*4.00*	*18.00*	*16.8*	
60770	Special High Grade Acid Phosphate	Manufacturer	17.80	2.75	20.55	21.4	60770
			16.00	*2.00*	*18.00*	*19.2*	
	St. Matthews Produce Exchange, St. Matthews, Ky.						
62358	16% Acid Phosphate	Manufacturer	16.15	0.65	16.80	19.4	62358
			16.00	*1.00*	*17.00*	*19.2*	
	Swift & Co., Inc., National Stock Yards, Ill.						
60787	Swift's High Grade Acid Phosphate Fertilizer						60787
62721		J. H. West, Dawson Springs	19.65	1.05	20.70	23.6	62721
63181		John B. Marriott, Cecilia	15.25	1.90	17.15	18.3	63181
			16.00			*19.2*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID			Index of Relative Value	Station Number
			Available	Insoluble	Total		
	Tenn. Chem. Co. (Armour owned), Louisville, Ky., Nashville, Tenn., and Cincinnati, O.						
60849	Ox Phosphate						60849
63191		J. M. Johnson, Benton	13.20	4.70	17.90	15.8	63191
			12.00	*2.00*	*14.00*	*14.4*	
60850	Ox High Grade Dissolved Bone						60850
62736		J. E. Sego & Sons, Munfordville	15.65	0.85	16.50	18.8	62736
			14.00	*2.00*	*16.00*	*16.8*	
60851	Ox Tennessee Best Acid Phosphate						60851
62737		J. S. Duke, Crab Orchard	17.50	0.80	18.30	21.0	62737
62738		J. E. Sego & Sons, Munfordville	16.35	1.10	17.45	19.6	62738
			16.00	*2.00*	*18.00*	*19.2*	
62844	Ox 16%						62844
63194		W. F. Grainger, Franklin	17.65	1.05	18.70	21.2	63194
63195		J. C. Miller, Horse Cave	17.20	1.10	18.30	20.6	63195
			16.00	*2.00*	*18.00*	*19.2*	
62845	Ox 20%	Manufacturer	22.80	0.30	23.10	27.4	62845
			20.00	*2.00*	*22.00*	*24.0*	
	Tennessee Coal, Iron and Railroad Co., Birmingham, Ala.						
60921	Duplex Basic Phosphate						60921
62380		Experiment Station Farm, Lexington			19.05	22.9	62380
62739		Taylor County Supply Co., Campbellsville			19.40	23.4	62739
62740		Farmers' Union Supply Co., Bowling Green			18.00	21.6	62740
63197		Farmers' Union Supply Co., Bowling Green			18.00	21.6	63197

63198		Farmers' Union Supply Co., Somerset			18.50	22.2	63198
					18.00	*21.6*	
60922	14% Duplex Basic Phosphate	Manufacturer			13.45	16.1	60922
					14.00	*16.8*	
60923	12% Duplex Basic Phosphate						60923
					12.00	*14.4*	
	Tupelo Fertilizer Factory, Tupelo, Miss.						
62458	Tupelo Special High Grade Acid Phosphate	Manufacturer	17.60	0.30	17.90	21.1	62458
			18.00	*1.00*	*19.00*	*21.6*	
62459	Cotton Belt High Grade Acid Phosphate	Manufacturer	17.15	0.25	17.40	20.6	62459
			16.00	*1.00*	*17.00*	*19.2*	
	Victor Guano Co., Nashville, Tenn.						
60756	High Grade Acid Phosphate	Manufacturer	15.90	4.85	20.75	19.1	60756
			14.00	*4.00*	*18.00*	*16.8*	
60757	Special High Grade Acid Phosphate						60757
62741		L. F. Hubble, Somerset	16.60	3.80	20.40	19.9	62741
62960		Lambert-Gresham Hdw. Co., Henderson	17.65	2.15	19.80	21.2	62960
			16.00	*2.00*	*18.00*	*19.2*	
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.						
62247	V-C Red Cross 14%						62247
62961		C. L. Mason, Fordsville	15.10	1.30	16.40	18.1	62961
63199		Taylor County Supply Co., Campbellsville	17.25	0.45	17.70	20.7	63199
			14.00	*1.50*	*15.50*	*16.8*	
62248	V-C 16% Acid Phosphate						62248
62743		Estes & Hines, Science Hill	18.55	0.95	19.50	22.3	62743
62744		Jewell & Withers, Center	18.85	0.90	19.75	22.6	62744
			16.00	*1.50*	*17.50*	*19.2*	
62249	V-C 20% Acid Phosphate						62249
62745		R. H. Chrisman, Berea	21.45	0.95	22.40	25.7	62745
62962		Eaton & McGuire, Clay City	23.20	0.70	23.90	26.6	62962
			20.00	*1.50*	*21.50*	*24.0*	
	Wood, Stubbs & Co. Store, Inc., Louisville, Ky.						
62073	Acme High Grade Phosphate	Manufacturer	16.70	0.65	17.35	20.04	62073
			16.00	*2.00*	*18.00*	*19.2*	

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	PHOSPHORIC ACID Available	PHOSPHORIC ACID Insoluble	PHOSPHORIC ACID Total	POTASH From Muriate	POTASH From Sulfate	Index of Relative Value	Station Number
	The Am. Agr. Chemical Co., Inc., Cin. Sales Dept., Cincinnati, O.								
60928	A. A. C. High Grade Bone and Potash	Manufacturer	11.35	0.45	11.80	5.20		38.0	60928
			10.00	*2.00*	*12.00*	*5.00*		*35.8*	
60933	Bowker's Dissolved Bone with Potash	Manufacturer	10.30	1.45	11.75	2.29		25.2	60933
			10.00	*2.00*	*12.00*	*2.00*		*23.8*	
60934	Bowker's Acid Phosphate and Potash	Manufacturer	13.40	0.60	14.00	2.18		29.1	60934
			12.00	*2.00*	*14.00*	*2.00*		*26.8*	
60946	Bowker's Potash Fertilizer								60946
62987		T. E. Richardson, Campbellsville	11.95	0.15	12.10	3.82	1.13	37.8	62987
			10.00	*2.00*	*12.00*	*5.00*		*35.8*	
60951	Bradley's Alkaline Bone with Potash	Manufacturer	10.30	1.45	11.75	2.29		25.2	60951
			10.00	*2.00*	*12.00*	*2.00*		*23.8*	
60952	Bradley's Twelve-Two	Manufacturer	13.40	0.60	14.00	2.18		29.1	60952
			12.00	*2.00*	*14.00*	*2.00*		*26.8*	
60967	Cleveland Dryer Works Soluble Bone with Potash	Manufacturer	10.30	1.45	11.75	2.29		25.2	60967
			10.00	*2.00*	*12.00*	*2.00*		*23.8*	
60968	Cleveland Dryer Works Twelve-Two	Manufacturer	13.40	0.60	14.00	2.18		29.1	60968
			12.00	*2.00*	*14.00*	*2.00*		*26.8*	
60983	Red Line Phosphate with Potash								60983
62489		E. Farris & Co., Cave City	10.80	0.70	11.50	1.98		24.4	62489
			10.00	*2.00*	*12.00*	*2.00*		*23.8*	

60984	Michigan Carbon Wks. Twelve-Two	Manufacturer	13.40	0.60	14.00	2.18		29.1	60984
			12.00	*2.00*	*14.00*	*2.00*		*26.8*	
60996	Michigan Carbon Works **High** Potash Phosphate								60996
63002		Frank Baker, Clarkson	11.85	0.65	12.50	5.88		41.6	63002
			10.00	*2.00*	*12.00*	*5.00*		*35.8*	
62004	N-W Horseshoe Brand **Bone** with Potash								62004
62507		L. B. Sievers & Son, Somerset	11.85	0.40	12.25	1.98		25.9	62507
63007		L. B. Sievers & Son, Somerset	11.20	1.00	12.20	0.92	1.25	25.9	63007
			10.00	*2.00*	*12.00*	*2.00*		*23.8*	
62005	N-W Horseshoe Brand Twelve-Two	Manufacturer	13.40	0.60	14.00	2.18		29.1	62005
			12.00	*2.00*	*14.00*	*2.00*		*26.8*	
62017	N-W Horseshoe Brand 10-5 Potash Manure								62017
62512		L. B. Sievers & Son, Somerset	11.65	0.95	12.60	5.06		38.1	62512
62885		T. J. Whittinghill, Fordsville	11.50	1.40	12.90	5.55		36.0	62885
63012		Woodson Lewis, Greensburg	11.55	1.05	12.60	5.01		37.8	63012
			10.00	*2.00*	*12.00*	*5.00*		*35.8*	
62023	Packers Boar's Head Br. Ky. Potash Mixture	Manufacturer	10.30	1.45	11.75	2.29		25.2	62023
			10.00	*2.00*	*12.00*	*2.00*		*23.8*	
62024	Packers Boar's Head Br. Twelve-Two	Manufacturer	13.40	0.60	14.00	2.18		29.1	62024
			12.00	*2.00*	*14.00*	*2.00*		*26.8*	
62036	Packers Boar's Head Br. Potash Phosphate Fertilizer	Manufacturer	11.35	0.45	11.80	5.20		38.0	62036
			10.00	*2.00*	*12.00*	*5.00*		*35.8*	
	Armour Fertilizer Wks., Louisville, Ky., Nashville, Tenn. and Cincinnati, O.								
60862	Armour's Potash Mixture								60862
62517		M. T. Jasper & Son, Mintonville	10.50	3.25	13.75	1.71		23.9	62517
62887		G. M. Proctor, Grayson	10.45	1.05	11.50	1.69		22.9	62887
			10.00	*4.00*	*14.00*	*2.00*		*24.6*	

Table IV.—Acid Phosphates with Potash.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	Phosphoric Acid			Potash		Index of Relative Value	Station Number
			Available	Insoluble	Total	From Muriate	From Sulfate		
	Armour Fertilizer Works								
60863	Armour's Big Crop Potash Formula	Manufacturer	11.65	3.00	14.65	3.82		34.0	60863
			10.00	*4.00*	*14.00*	*4.00*		*32.6*	
60864	Armour's Big Crop Superior Tobacco Grower								60864
62538		Wilson-Wyne & Co., Russellville	10.40	1.60	12.00	**0.80**	**3.50**	**33.4**	62538
			10.00	*4.00*	*14.00*		*5.00*	*36.6*	
60865	Armour's Big Crop Alkaline Bone								60865
62518		Thurman & Enlow, Hodgenville	**11.20**	0.60	**11.80**	2.10		**25.4**	62518
			12.00	*4.00*	*16.00*	*2.00*		*27.6*	
62833	Armour's Big Crop Ten-Ten	Manufacturer	10.50	4.35	14.85	8.96	1.02	57.4	62833
			10.00	*4.00*	*14.00*	*10.00*		*56.6*	
62834	Armour's Big Crop Phosphate and Potash								62834
63033		Thurman & Enlow, Hodgenville	12.30	0.30	**12.60**	1.75		**25.6**	63033
63034		S. D. Holland & Co., Gamaliel	13.10	2.95	16.05	**1.39**		**26.4**	63034
			12.00	*4.00*	*16.00*	*2.00*		*27.6*	
60883	Tuscarora Potash Mixture	Manufacturer	11.25	3.30	14.55	2.14		26.8	60883
			10.00	*4.00*	*14.00*	*2.00*		*24.6*	
60884	Tuscarora Superior Tobacco Grower	Manufacturer	11.80	2.95	14.75		4.67	37.6	60884
			10.00	*5.00*	*15.00*		*5.00*	*37.0*	

	Calumet Fertilizer Co., New Albany, Ind.								
62391	Calumet Br. Phosphate and Potash	Manufacturer	10.70	1.10	**11.80**		2.12	25.0	62391
			10.00	*4.00*	*14.00*		*2.00*	*24.6*	
62394	Calumet Br. Ten-Four	Manufacturer	10.90	1.00	**11.90**	1.08	3.28	34.2	62394
			10.00	*4.00*	*14.00*		*4.00*	*32.6*	
62395	Calumet Br. Twelve-Two	Manufacturer	13.55	1.05	14.60	0.56	1.80	30.2	62395
			12.00	*4.00*	*16.00*		*2.00*	*27.6*	
62399	Calumet Br. Ten-Ten Hummer	Manufacturer	13.40	0.50	13.90	2.74	7.27	60.3	62399
			10.00	*4.00*	*14.00*		*10.00*	*56.6*	
	The Cincinnati Phosphate Co. (Armour owned), Cincinnati, Ohio								
62328	Dissolved Phosphate and Potash								62328
			10.00	*1.00*	*11.00*	*4.00*		*31.4*	
62329	Alkaline Phosphate								62329
			10.00	*1.00*	*11.00*	*2.00*		*23.4*	
62792	Alkaline Phosphate	Manufacturer	13.65	1.55	15.20	2.55		31.3	62792
			12.00	*1.00*	*13.00*	*2.00*		*26.4*	
	Consolidated Chemical Co., Louisville, Ky.								
60705	Camel Br. Potash Tobacco Fertilizer								60705
62550		J. F. Collings, Shepherdsville	12.20	2.50	14.70	**1.36**	**2.93**	36.3	62550
63048		Duncan Bros., Monticello	11.15	1.00	12.15	5.26		38.2	63048
			10.00	*2.00*	*12.00*		*5.00*	*35.8*	
60706	Camel Br. Phosphate and Potash								60706
62551		Ky. Feed and Grain Co., Middlesboro	11.70	2.60	14.30	0.56	1.49	27.2	62551
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
	The Empire Guano Co., Nashville, Tenn.								
60740	Bone and Potash	Manufacturer	11.10	10.75	21.85		3.70	35.8	60740
			10.00	*6.00*	*16.00*		*2.00*	*25.4*	

Table IV.—Acid Phosphates with Potash.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	Phosphoric Acid			Potash		Index of Relative Value	Station Number
			Available	Insoluble	Total	From Muriate	From Sulfate		
	The Empire Guano Co.								
60741	High Grade Potash Phosphate	Manufacturer	12.25	9.60	21.85	4.31		39.5	60741
			10.00	*7.00*	*17.00*	*4.00*		*33.8*	
	Federal Chemical Co., Inc., Louisville, Ky.								
62109	Double Phosphate and Potash Formula	Manufacturer	10.35	11.25	21.60	0.72	4.97	42.8	62109
			8.00	*8.00*	*16.00*		*4.00*	*31.2*	
62110	Potash Special	Manufacturer	12.30	9.95	22.25	1.22	1.57	33.6	62110
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
62111	Potash Mixture								62111
63062		A. W. Tarter, Columbia	11.40	1.30	12.70	3.45		31.4	63062
			10.00	*2.00*	*12.00*		*4.00*	*31.8*	
62112	Potash Compound	Manufacturer	14.05	7.15	21.20	0.74	2.66	37.5	62112
			12.00	*2.00*	*14.00*		*2.00*	*26.8*	
62113	Black Land Special	Manufacturer	15.25	5.05	20.30	0.78	4.11	44.0	62113
			12.00	*2.00*	*14.00*		*4.00*	*34.8*	
62134	Daybreak Champion Potash Fertilizer	Manufacturer	10.20	13.00	23.20	0.58	1.65	29.4	62134
			8.00	*8.00*	*16.00*		*2.00*	*23.2*	
62135	Daybreak Potash Special	Manufacturer	13.00	9.70	22.70	0.60	2.24	34.7	62135
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
62136	Daybreak Potash Mixture	Manufacturer	12.85	8.65	21.50	0.64	3.72	40.2	62136
			10.00	*2.00*	*12.00*		*4.00*	*31.8*	
62137	Daybreak Phosphate and Potash	Manufacturer	14.20	7.20	21.40		3.30	37.4	62137
			12.00	*2.00*	*14.00*		*2.00*	*26.8*	
62158	Mogul Potash Fertilizer	Manufacturer	10.20	13.00	23.20	0.58	1.65	29.4	62158
			8.00	*8.00*	*16.00*		*2.00*	*23.2*	

	Fox Chemical Co., Br. Federal Chem. Co., Inc., Louisville, Ky.								
62183	Fox Ideal Potash Fertilizer	Manufacturer	10.20	13.00	23.20	0.58	1.65	29.4	62183
			8.00	*8.00*	*16.00*		*2.00*	*23.2*	
62184	Fox Potash Special								62184
62584		M. L. Spurling, Campbellsville	10.95	4.05	15.00	1.72		24.9	62584
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
62185	Fox Bone Phosphate and Potash	Manufacturer	12.85	8.65	21.50	0.64	3.72	40.2	62185
			10.00	*2.00*	*12.00*		*4.00*	*31.8*	
62186	Fox Bone Phosphate	Manufacturer	14.20	7.20	21.40		3.30	37.4	62186
			12.00	*2.00*	*14.00*		*2.00*	*26.8*	
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.								
62214	Globe Tip Top Potash Fert.								62214
62601		Williamsburg Hdw. Co., Williamsburg	8.90	8.35	17.25	2.25		25.7	62601
			8.00	*8.00*	*16.00*		*2.00*	*23.2*	
62215	Globe Potash Special								62215
62602		Williamsburg Hdw. Co., Williamsburg	12.20	3.10	15.30	1.77		26.6	62602
63088		Lee Dunn, Hodgenville	9.95	0.35	10.30	2.33		24.4	63088
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
62216	Globe Bone Phosphate and Pot.								62216
63089		Planters Hdw. Co., Hopkinsville	12.95	0.75	13.70	3.38		33.3	63089
63090		J. B. Nunn, Sturgis	12.20	1.70	13.90	3.27		32.1	63090
			10.00	*2.00*	*12.00*		*4.00*	*31.8*	
62217	Globe Potash Compound	Manufacturer	14.20	7.20	21.40		3.30	37.4	62217
			12.00	*2.00*	*14.00*		*2.00*	*26.8*	
	Grove's Fertilizer Works (The Joslin-Schmidt Co.), Cincinnati, O.								
62770	Phosphate and Potash								62770
62919		J. F. Collings, Shepherdsville	10.75	0.95	11.70	3.84		31.9	62919
			10.00	*1.00*	*11.00*	*4.00*		*31.4*	

Table IV.—Acid Phosphates with Potash.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	Phosphoric Acid			Potash		Index of Relative Value	Station Number
			Available	Insoluble	Total	From Muriate	From Sulfate		
	Grove's Fertilizer Works								
62771	Corn and Tobacco								62771
62920		Sturgis Impl. Co., Sturgis ...	9.75	0.75	10.50	2.04		23.1	62920
62921		Thomas & Dodd, Burtonville	10.65	0.90	11.55	2.06		24.6	62921
63096		J. F. Collings, Shepherdsville	10.30	1.45	11.75	1.63		22.6	63096
			10.00	*1.00*	*11.00*	*2.00*		*23.4*	
	International Agr'l Corp., Inc., Cincinnati, O.								
60687	Buffalo Phosphate and Potash	Manufacturer	14.10	0.95	15.05	2.22		30.4	60687
			12.00	*5.00*	*17.00*	*2.00*		*28.0*	
60672	I. A. C. Standard Potash Mixture								60672
63107		C. M. Langdon, Science Hill.	12.65	1.50	14.15	4.88		39.1	63107
			10.00	*5.00*	*15.00*	*5.00*		*37.0*	
	The Jarecki Chem. Co. (Armour owned), Cincinnati, O.								
62310	Super Phosphate and Potash								62310
			10.00	*1.00*	*11.00*	*4.00*		*31.4*	
62311	Square Brand Phosphate and Potash								62311
			10.00	*1.00*	*11.00*	*2.00*		*23.4*	
62785	Phosphate and Potash	Manufacturer	13.65	1.55	15.20	2.55		31.3	62785
			12.00	*1.00*	*13.00*	*2.00*		*26.4*	
	The Kaufman Fert. Co. (Armour owned), Cincinnati, O.								
62343	Dissolved Phosphate and Pot.								62343
			10.00	*1.00*	*11.00*	*4.00*		*31.4*	

62344	Alkaline Phosphate								62344
			10.00	*1.00*	*11.00*	*2.00*		*23.4*	
62800	Alkaline Phosphate	Manufacturer	13.65	1.55	15.20	2.55		31.3	62800
			12.00	*1.00*	*13.00*	*2.00*		*26.4*	
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.								
62240	Gold Medal Potash Fertilizer	Manufacturer	10.20	13.00	23.20	0.58	1.65	29.4	62240
			8.00	*8.00*	*16.00*		*2.00*	*23.2*	
62241	O. K. Potash Special								62241
62639		Tye-Siler & Co., Corbin	10.90	3.60	14.50	2.15		26.4	62639
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
	Louisville Fert. Co. (Armour owned), Louisville, Ky., Nashville, Tenn. and Cincinnati, O.								
60802	Potash Mixture								60802
62650		Miss M. Muster, E. Bernstadt	10.80	0.35	**11.15**	2.02		24.4	62650
62651		W. T. Kirkman, Elkton	10.70	0.60	**11.30**		2.26	25.4	62651
			10.00	*4.00*	*14.00*	*2.00*		*24.6*	
60803	Superior Tobacco Grower								60803
62652		F. B. Henry & Sons, Carlisle	10.15	0.15	**10.30**		**4.15**	**31.9**	62652
			10.00	*4.00*	*14.00*		*5.00*	*36.6*	
62806	Big Ben	Manufacturer	10.95	4.80	15.75	10.02		58.4	62806
			10.00	*4.00*	*14.00*	*10.00*		*56.6*	
62807	Phosphate and Potash	Manufacturer	14.00	4.40	18.40	2.19		31.5	62807
			12.00	*4.00*	*16.00*	*2.00*		*27.6*	
62808	Black Soil Special	Manufacturer	12.40	4.60	17.00	4.03		36.6	62808
			10.00	*4.00*	*14.00*	*4.00*		*32.6*	
	Morris & Co., Chicago, Ill.								
62443	Special Big Five—Acid Phosphate and Potash								62443
			10.00				*2.00*	*23.0*	

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	PHOSPHORIC ACID			POTASH		Index of Relative Value	Station Number.
			Available	Insoluble	Total	From Muriate	From Sulfate		
	Mt. Pleasant Fert. Co., Inc., Subsidiary of Va.-Car. Chem. Co., Mt. Pleasant, Tenn.								
62085	Mt. Pleasant Superior Tobacco Grower	Manufacturer	11.70	3.50	15.20	**3.38**		32.5	62085
			8.00	*2.00*	*10.00*		*4.00*	*28.8*	
62966	Mt. Pleasant Bone and Potash	Manufacturer	12.10	5.30	17.40		**2.57**	30.6	62966
			10.00	*2.00*	*12.00*		*3.00*	*27.8*	
62968	Black Patch Wheat and Clover	Manufacturer	12.05	7.95	20.00	**1.48**		27.2	62968
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
	Price Chemical Co., Inc., Louisville, Ky.								
62062	Potash Tobacco Fertilizer								62062
62684		G. W. Collins, Columbia	11.70	1.85	13.55	0.92	4.54	40.1	62684
62946		G. M. Johnson, Hartford	11.10	1.60	12.70	0.58	4.34	37.0	62946
			10.00	*2.00*	*12.00*		*5.00*	*35.8*	
62063	Phosphate and Potash								62063
62685		John Middleton, Hodgenville	13.15	1.15	14.30	0.42	1.97	29.3	62685
63150		J. W. Nall, Clay	13.25	1.45	14.70		1.83	27.8	63150
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
	Rasin-Monumental Co., Subsidiary of Va.-Car. Chem. Co., Inc., Cincinnati, O.								
62268	Rasin's Royal Grain Grower								62268
63159		C. E. Preston, Smith's Grove	13.30	1.35	14.65		2.50	30.5	63159
			12.00	*1.50*	*13.50*	*2.00*		*26.6*	
	Read Phosphate Co., Nashville, Tenn.								
60715	Alkaline Bone	Manufacturer	11.10	10.75	21.85	3.70		35.8	60715
			10.00	*6.00*	*16.00*	*2.00*		*25.4*	

60716	H. Gr. Potash Mixture	Manufacturer	12.25	9.60	21.85	4.31		39.5	60716
			10.00	*7.00*	*17.00*	*4.00*		*33.8*	
	Smith Bros., New Albany, Ind.								
62039	Bone and **Potash**								62039
62704		R. M. Smith, Lagrange	10.65	1.25	11.90	2.22		25.4	62704
			10.00	*2.00*	*12.00*		*2.00*	*23.8*	
	St. Bernard Fertilizer Co., Nashville, Tenn.								
60767	Standard Potash Acid	Manufacturer	11.10	10.75	21.85	3.70		35.8	60767
			10.00	*6.00*	*16.00*	*2.00*		*25.4*	
60768	H. Gr. Potash Acid	Manufacturer	12.25	9.60	21.85	4.31		39.5	60768
			10.00	*7.00*	*17.00*	*4.00*		*33.8*	
	Swift & Co., Inc., National Stock Yards, Ill.								
60785	Swift's 14-2 Phosphate and Potash Fertilizer	Manufacturer	15.85	1.95	17.80	3.11		37.0	60785
			14.00			*2.00*		*29.0*	
60786	Swift's 12-4 Phosphate and Potash Fertilizer	Manufacturer	13.50	2.40	15.90	**3.19**		34.0	60786
			12.00			*4.00*		*34.0*	
	Tenn. Chem. Co. (Armour owned), Louisville, Ky., Nashville, Tenn. and Cincinnati, O.								
60825	Ox Potash Mixture								60825
63184		Ratliff Hdw. Co., Princeton	10.95	3.30	14.25	1.86		25.2	63184
63185		J. B. Nunn, Sturgis	9.55	3.50	13.05	**1.61**		**22.2**	63185
			10.00	*4.00*	*14.00*	*2.00*		*24.6*	
60826	Ox Superior **Tobacco Grower**	Manufacturer	11.80	2.95	14.75		4.67	37.6	60826
			10.00	*4.00*	*14.00*		*5.00*	*36.6*	
62848	Ox Big Ben	Manufacturer	10.85	4.30	15.15	8.20	1.84	58.2	62848
			10.00	*4.00*	*14.00*	*10.00*		*56.6*	
62849	Ox Phosphate and **Potash**								62849
63196		S. O. Moody, Auburn	13.35	2.20	15.55	1.94		28.7	63196
			12.00	*4.00*	*16.00*	*2.00*		*27.6*	

Table IV.—Acid Phosphates with Potash.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	Phosphoric Acid			Potash		Index of Relative Value	Station Number
			Available	Insoluble	Total	From Muriate	From Sulfate		
	Tenn. Chem. Co.								
62850	Ox Potash Formula	Manufacturer	12.10 *10.00*	4.50 *4.00*	16.60 *14.00*	4.46 *4.00*		37.8 *32.6*	62850
	Victor Guano Co., Nashville, Tenn.								
60754	Bone and Potash	Manufacturer	11.10 *10.00*	10.75 *6.00*	21.85 *16.00*	3.70 *2.00*		35.8 *25.4*	60754
60755	H. Gr. Bone and Potash	Manufacturer	12.25 *10.00*	9.60 *7.00*	21.85 *17.00*	4.31 *4.00*		39.5 *33.8*	60755
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.								
62250	V-C Prolific Grain Grower								62250
62746		Jack Hysinger, Mt. Vernon..	12.75 *12.00*	2.25 *1.50*	15.00 *13.50*	0.44 *2.00*	2.12	30.3 *26.6*	62746
	Wood, Stubbs & Co. Store, Inc., Louisville, Ky.								
62071	Acme Crop Booster	Manufacturer	11.80 *10.00*	0.55 *2.00*	12.35 *12.00*		5.29 *5.00*	39.0 *35.8*	62071

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc., Cin. Sales Dept., Cincinnati, O.	
60924	A. A. C. Special Tobacco Grower	
62465		L. B. Sievers & Son, Somerset
62466		Skaggs & Nunn, Horse Cave
60927	A. A. C. Little Wonder Fertilizer	Manufacturer
60935	Bowker's 1-10 Ammoniated Acid Phosphate	
62474		Browning-McReynolds & Co., Lewisb'g
60936	Bowker's 2-10 Ammoniated Acid Phosphate	Manufacturer
60937	Bowker's 2-12 Ammoniated Acid Phosphate	
62475		W. R. Strange & Co., Middlesboro
60953	Bradley's 1-10 Ammoniated Acid Phosphate	Manufacturer
60954	Bradley's 2-10 Ammoniated Acid Phosphate	Manufacturer
60955	Bradley's 2-12 Ammoniated Acid Phosphate	Manufacturer
60969	Cleveland Dryer Works 1-10 Ammoniated Acid Phosphate	Manufacturer
60970	Cleveland Dryer Works 2-10 Ammoniated Acid Phosphate	Manufacturer
60971	Cleveland Dryer Works 2-12 Ammoniated Acid Phosphate	Manufacturer
60985	Michigan Carbon Works 1-10 Ammoniated Acid Phosphate	
62992		Sharpe & Brown, Liberty

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
									60924
12.30	1.50	13.80		0.98	0.88	1.86	2.26	32.1	62465
12.25	1.45	13.70		1.05	0.71	1.76	2.14	31.3	62466
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
12.25	0.50	12.75		0.29	0.62	0.91	1.10	25.0	60927
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	
									60935
11.75	1.00	12.75		0.32	0.53	0.85	1.03	24.0	62474
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	
12.30	1.50	13.80		0.66	1.01	1.67	2.03	30.7	60936
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
									60937
13.95	1.40	15.35		1.18	0.64	1.82	2.21	34.2	62475
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
12.25	0.50	12.75		0.29	0.62	0.91	1.10	25.0	60953
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	
12.30	1.50	13.80		0.66	1.01	1.67	2.03	30.7	60954
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
14.65	1.15	15.80		0.60	1.16	1.76	2.14	34.8	60955
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
12.25	0.50	12.75		0.29	0.62	0.91	1.10	25.0	60969
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	
12.30	1.50	13.80		0.66	1.01	1.67	2.03	30.7	60970
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
14.65	1.15	15.80		0.60	1.16	1.76	2.14	34.8	60971
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
									60985
11.45	1.15	12.60		0.29	0.60	0.89	1.08	23.9	62992
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co.	
60986	Michigan Carbon Works 2-10 Ammoniated Acid Phosphate	
62878		Mitchell & Dunigan, Clay ....
60987	Michigan Carbon Works 2-12 Ammoniated Acid Phosphate	Manufacturer ....
62006	N-W Horseshoe Br. 1-10 Ammoniated Acid Phosphate	
63008		E. S. Ferrill & Son, Buffalo ....
63009		L. B. Sievers & Son, Somerset ....
62007	N-W Horseshoe Br. 2-10 Ammoniated Acid Phosphate	Manufacturer ....
62008	N-W Horseshoe Br. 2-12 Ammoniated Acid Phosphate	Manufacturer ....
62025	Packers Boar's Head Br. 1-10 Ammoniated Acid Phosphate	Manufacturer ....
62026	Packers Boar's Head Br. 2-10 Ammoniated Acid Phosphate	Manufacturer ....
62027	Packers Boar's Head Br. 2-12 Ammoniated Acid Phosphate	Manufacturer ....
	Armour Fertilizer Works, Louisville, Ky., Nashville, Tenn., and Cincinnati, O.	
60856	Armour's Phosphate and Tankage	Manufacturer ....
60866	Armour's Grain Special	
62519		L. Jackson, Caneyville ....
62520		Sam Terry, Big Clifty ....
60867	Armour's Ammoniated Mixture	
62521		Sam Terry, Big Clifty ....
62522		Ed. Allen & Co., Smith's Grove ......

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
									60986
11.90	1.60	13.50		0.59	1.21	1.80	2.19	31.1	62878
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
14.65	1.15	15.80		0.60	1.16	1.76	2.14	34.8	60987
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
									62006
10.35	1.80	12.15		0.39	0.55	0.94	1.14	22.8	63008
10.50	1.90	12.40		0.35	0.57	0.92	1.12	23.0	63009
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	
12.30	1.50	13.80		0.66	1.01	1.67	2.03	30.7	62007
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
14.65	1.15	15.80		0.60	1.16	1.76	2.14	34.8	62008
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
12.25	0.50	12.75		0.29	0.62	0.91	1.10	25.0	62025
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	
12.30	1.50	13.80		0.66	1.01	1.67	2.03	30.7	62026
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
14.65	1.15	15.80		0.60	1.16	1.76	2.14	34.8	62027
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
13.10	2.05	15.15		1.08	0.81	1.89	2.29	33.7	60856
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
									60866
14.70	0.50	15.20		0.20	0.32	0.52	0.63	25.9	62519
12.45	0.30	12.75				0.45	0.55	22.0	62520
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
									60867
14.65	0.45	15.10				0.45	0.55	25.3	62521
14.15	2.70	16.85		0.32	0.30	0.62	0.75	26.7	62522
14.00	*4.00*	*18.00*				*0.41*	*0.50*	*25.5*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works	
60876	Armour's Big Crop Bone and Tankage	Manufacturer ....
60905	Ideal Corn Grower	Manufacturer ....
62822	Armour's Tankage and Phosphate	
63022		S. D. Holland & Co., Gamaliel ....
63023		Lebanon Carriage and Implement Co., Lebanon ....
62823	Armour's Grain and Grass Grower	Manufacturer ....
62827	Armour's Big Crop Half Bone and Phosphate	
63027		Lebanon Carriage and Implement Co., Lebanon ....
63028		Thurman & Enlow, Hodgenville ......
62831	Armour's Big Crop Vegetable Grower	Manufacturer ....
60889	Tuscarora Phosphate and Tankage	Manufacturer ....
60895	Tuscarora Bone and Tankage	Manufacturer ....
62460	Tuscarora Acid and Ammonia	Manufacturer ....
	Calumet Fertilizer Co., New Albany, Ind.	
62384	Calumet Br. Potato and Tobacco Grower	Manufacturer ....
62388	Calumet Br. Special Crop Grower	Manufacturer ....
62389	Calumet Br. Extra Am. Bone Phos.	Manufacturer ....
62403	Calumet Br. Bone Meal Mixture with Phosphate	Manufacturer ....
	The Cincinnati Phosphate Co. (Armour owned), Cincinnati, O.	
62325	Clay Soil Special	

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
18.00	5.75	23.75				0.87	1.06	35.4	60876
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
13.10	2.05	15.15		1.08	0.81	1.89	2.29	33.7	60905
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
									62822
11.70	2.80	14.50		0.38	0.39	0.77	0.93	24.1	63022
13.10	0.55	13.65		0.38	0.36	0.74	0.90	25.1	63023
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*25.3*	
14.30	4.55	18.85		1.10	0.70	1.80	2.19	35.9	62823
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
									62827
18.30	3.90	22.20				1.23	1.49	37.6	63027
15.65	6.75	22.40				1.14	1.38	34.2	63028
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
11.50	4.30	15.80		2.23	1.19	3.52	4.27	43.6	62831
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
13.10	2.05	15.15		1.08	0.81	1.89	2.29	33.7	60889
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
18.00	5.75	23.75				0.87	1.06	35.4	60895
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
15.50	1.80	17.30		0.24	0.35	0.59	0.72	28.1	62460
14.00	*4.00*	*18.00*				*0.41*	*0.50*	*25.5*	
9.50	1.50	11.00				2.26	2.74	30.7	62384
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*33.9*	
12.75	1.05	13.80		0.51		0.51	0.62	23.1	62388
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
13.25	1.40	14.65		1.12	0.51	1.63	1.98	31.9	62389
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
14.55	6.60	21.15				1.13	1.37	32.4	62403
12.00	*8.00*	*20.00*				*1.23*	*1.50*	*29.8*	
									62325
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*30.0*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Cincinnati Phosphate Co.	
62326	Favorite Grain Grower	
62327	Bonus A Humus Phosphate	
62332	Bone Meal and Acid Phosphate	
62791	Bonus A Humus Phosphate	Manufacturer ....
62857	"X" Bone Meal and Acid Phosphate	Manufacturer ....
	Consolidated Chemical Co., Louisville, Ky.	
60701	Camel Br. H. Gr. Tobacco Bed Spl	Manufacturer ....
60702	Camel Br. H. Gr. Fertilizer	Manufacturer ....
60703	Camel Br. Corn, Wheat and Oats Grower	Manufacturer ....
60704	Camel Br. No. 1 Fertilizer	Manufacturer ....
	Duncan & Sherley, Lagrange, Ky.	
62372	Tiger Br. Corn and Wheat Grower	
63053		Manufacturer's warehouse ....
62456	Tiger Br. Phosphate and Tankage	
62555		Manufacturer's warehouse ....
63054		Manufacturer's warehouse ....
	The Empire Guano Co., Nashville, Tenn.	
60737	Climax Formula	Manufacturer ....
60738	High Grade Grain Special	Manufacturer ....
60744	Bone Mixture	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
									62326
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*21.1*	
									62327
12.00	*1.00*	*13.00*				*0.41*	*0.50*	*21.3*	
									62332
10.00	*10.00*	*20.00*				*1.23*	*1.50*	*27.6*	
12.30	2.10	14.40		0.52	0.27	0.78	0.95	24.8	62791
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*24.1*	
13.15	9.45	22.60				0.93	1.13	30.0	62857
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
11.25	0.45	11.70	2.41		0.45	2.86	3.47	37.1	60701
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
11.10	0.70.	11.80	1.21		0.42	1.63	1.98	28.3	60702
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
15.90	0.40	16.30	0.48			0.48	0.58	27.4	60703
14.00	*4.00*	*18.00*				*0.41*	*0.50*	*25.5*	
13.35	0.35	13.70	0.52			0.52	0.63	23.8	60704
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
									62372
11.55	0.75	12.30		0.27	0.37	0.64	0.78	22.1	63053
10.00	*4.00*	*14.00*				*0.41*	*0.50*	*19.5*	
									62456
13.75	0.35	14.10				0.83	1.01	26.6	62555
13.75	0.60	14.35		0.53	0.41	0.94	1.14	27.5	62054
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*24.9*	
14.10	4.30	18.40	0.35		0.37	0.72	0.87	27.9	60737
12.00	*7.00*	*19.00*				*0.41*	*0.50*	*23.7*	
16.15	2.20	18.35		0.66	0.45	1.11	1.35	32.9	60738
16.00	*2.00*	*18.00*				*0.82*	*1.00*	*30.5*	
12.65	9.30	21.95				0.98	1.19	29.6	60744
13.00	*7.00*	*20.00*				*0.82*	*1.00*	*28.0*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Evansville Packing Co., Evansville, Ind.	
62280	Ammoniated Phosphate	Manufacturer ....
62281	Corn and Wheat Grower (without Potash)	Manufacturer ....
62285	Wonder Growth	Manufacturer ....
	Federal Chemical Co., Inc., Louisville, Ky.	
62099	A-1 Fertilizer	
62903		Grayson County Supply Co., Leitchfield
62100	A-1 Corn and Wheat Fertilizer	
62455		W. H. Owen, Lily ....
62564		T. G. Moren, London ....
63060		Grayson County Supply Co., Leitchfield
63061		T. G. Moren, London ....
62101	A-1 Formula	Manufacturer ....
62102	High Grade Fertilizer	Manufacturer ....
62103	A-1 Soluble Vegetable Manure	Manufacturer ....
62104	A-1 Potato Grower	Manufacturer ....
62105	A-1 Extra Tobacco Special	
62565		Thompson Fertilizer Co., Mt. Sterling.
62106	Liberty Grain Grower	
62904		M. S. Crain, Jackson ....
62107	Standard Meal Mixture	Manufacturer ....
62108	Liberty Potato Grower	
62566		Smith & Dawson, Shepherdsville .....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
13.20	0.25	13.45				0.66	0.80	24.1	62280
12.00						*0.41*	*0.50*	*20.9*	
11.60	0.20	11.80	0.37		0.61	0.98	1.19	24.3	62281
10.00						*0.82*	*1.00*	*20.7*	
10.40	0.60	11.00	1.37		0.57	1.94	2.36	29.4	62285
10.00						*1.65*	*2.00*	*26.6*	
									62099
13.35	0.60	13.95				0.70	0.85	25.2	62903
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*25.3*	
									62100
15.10	1.70	16.80				1.00	1.21	30.3	62455
14.75	0.30	15.05				0.89	1.08	28.5	62564
14.60	0.60	15.20				0.93	1.13	28.7	63060
14.35	1.10	15.45				0.83	1.01	27.8	63061
14.00	*4.00*	*18.00*				*0.82*	*1.00*	*28.3*	
14.00	7.30	21.30		1.99	0.27	2.26	2.74	39.7	62101
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
16.20	4.20	20.40		1.73	0.23	1.96	2.38	39.7	62102
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
16.00	4.40	20.40		1.80	0.20	2.00	2.43	39.8	62103
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
12.95	5.90	18.85		3.55		3.55	4.31	46.6	62104
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
									62105
9.70	0.35	10.05	1.89		2.10	3.99	4.84	42.6	62565
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
									62106
11.15	11.05	22.20				0.46	0.56	24.4	62904
10.00	*10.00*	*20.00*				*0.41*	*0.50*	*21.9*	
12.30	10.30	22.60		1.16		1.16	1.41	30.7	62107
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
									62108
11.00	7.90	18.90		0.93	0.95	1.88	2.28	32.7	62566
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*30.6*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co., Inc., Louisville, Ky.	
62128	Red Rooster Mixture	Manufacturer
62129	Daybreak Nitro-Phosphate	Manufacturer
62130	Daybreak Harvest Home	Manufacturer
62131	Royal Meal Mixture	Manufacturer
62132	Daybreak Double-Duty Corn and Wheat Grower	Manufacturer
62133	Daybreak Half and Half Meal Mixture	Manufacturer
62152	1st Prize Phosphate Mixture	Manufacturer
62153	1st Prize Ammoniated Bone Phos.	Manufacturer
62154	Mogul Corn and Wheat Fertilizer	
62575		Ellis & Overstreet, Lagrange
62155	1st Prize Ammoniated Meal Mixture	Manufacturer
62156	Sweepstakes Corn and Wheat Grower	Manufacturer
62157	Blue Ribbon Meal Mixture	Manufacturer
	Fox Chem. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62178	Red Fox Mixture	Manufacturer
62179	Fox Ammoniated Phosphate	
62582		Rufus Hardwick, Burnside
62180	Fox Ammoniated Fertilizer	Manufacturer
62181	Fox Double-Quick Corn and Wheat Grower	
62583		T. N. Butt, Crab Orchard

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN						
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	Index of Relative Value	Station Number
15.75	5.85	21.60		0.65		0.65	0.79	30.5	62128
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
17.75	2.75	20.50		0.78		0.78	0.95	31.8	62129
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*27.0*	
12.25	7.15	19.40		3.43		3.43	4.16	45.3	62130
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*34.3*	
13.25	9.65	22.90		1.18		1.18	1.43	32.0	62131
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
12.65	9.80	22.45		1.18		1.18	1.43	31.2	62132
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
13.15	9.20	22.35		1.73	0.32	2.05	2.49	37.8	62133
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*30.6*	
15.75	5.85	21.60		0.65		0.65	0.79	30.5	62152
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
17.75	2.75	20.50		0.78		0.78	0.95	31.8	62153
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*27.0*	
									62154
13.30	2.50	15.80				0.91	1.10	27.3	62575
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*25.3*	
12.25	7.15	19.40		3.43		3.43	4.16	45.3	62155
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*34.3*	
13.25	9.65	22.90		1.18		1.18	1.43	32.0	62156
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
13.15	9.20	22.35		1.73	0.32	2.05	2.49	37.8	62157
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*30.6*	
15.75	5.85	21.60		0.65		0.65	0.79	30.5	62178
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
									62179
15.25	0.60	15.85				0.40	0.49	25.9	62582
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*27.0*	
12.25	7.15	19.40		3.43		3.43	4.16	45.3	62180
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*34.3*	
									62181
10.50	9.60	20.10				0.98	1.19	26.5	62583
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Fox Chemical Co.	
62182	Fox Half and Half Meal Mixture	Manufacturer ....
	Globe Fertilizer Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62209	Globe Gold Medal Mixture	
62600		Planters Hdw. Co., Hopkinsville .....
63085		I. K. Miller & Sons, Campbellsville ..
63086		Hutcheson Bros., Auburn ....
62210	Globe Grain-O-Phosphate	Manufacturer ....
62211	Globe Golden Harvest	Manufacturer ....
62212	Globe Double Value Corn and Wheat Grower	Manufacturer ....
62213	Globe Half and Half Meal Mixture	
63087		Vine Grove Feed Co., Vine Grove ....
	Grove's Fertilizer Works (The Joslin-Schmidt Co.), Cincinnati, O.	
62766	Ammoniated Phosphate	
63094		J. F. Collings, Shepherdsville ....
62767	Grain Grower	
62775	Bone and Phosphate	
62925		Minges Hardware Co., Newport ......
62776	Perfect Driller	
62926		Frank Baker, Clarkson ....
62927		J. F. Collings, Shepherdsville .. ..
63101		Frank Baker, Clarkson ....
63102		J. K. Layman, Caneyville ....
	Hall Seed Co., Inc., Louisville, Ky.	
62291	Halco Corn and Wheat Grower	Manufacturer ....

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
13.15	9.20	22.35		1.73	0.32	2.05	2.49	37.8	62182
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*30.6*	
									62209
14.90	2.55	17.45				0.45	0.55	26.5	62600
11.90	0.50	12.40				0.70	0.85	23.0	63085
14.15	1.80	15.95				0.43	0.52	25.0	63086
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
17.75	2.75	20.50		0.78		0.78	0.95	31.8	62210
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*27.0*	
12.25	7.15	19.40		3.43		3.43	4.16	45.3	62211
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*34.3*	
13.25	9.65	22.90		1.18		1.18	1.43	32.0	62212
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
									62213
9.95	9.20	19.15		0.87	0.85	1.72	2.09	30.7	63087
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*30.6*	
									62766
13.15	1.05	14.20		0.67	0.85	1.52	1.85	30.8	63094
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*30.0*	
									62767
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*24.1*	
									62775
13.60	6.10	19.70		0.51	0.49	1.00	1.21	29.8	62925
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
									62776
12.05	4.70	16.75				0.36	0.44	22.5	62926
12.10	4.50	16.60				0.39	0.47	22.7	62927
9.40	8.40	17.80				0.34	0.41	19.8	63101
10.05	8.30	18.35				0.35	0.42	20.9	63102
10.00	*6.00*	*16.00*				*0.41*	*0.50*	*20.3*	
9.90	3.70	13.60		0.64	0.31	0.95	1.15	23.0	62291
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Hall Seed Co.	
62292	Halco Potato Grower	Manufacturer ....
62293	Halco Vegetable Grower	Manufacturer ....
62297	Halco Half Bone and Phosphate	Manufacturer ....
	Hopkins Fertilizer Co., New Albany, Ind.	
60912	Favorite	Manufacturer ....
60913	Tankage and Phosphate Special	
62929		John Estrage, Clarkson ....
62363	Four Ten	
62932		Banks Hudson, Danville ....
	International Agr'l Corp., Inc., Cincinnati, O.	
60684	Buffalo Plant Bed Dressing	Manufacturer ....
60685	Buffalo Ammoniated Phosphate	Manufacturer ....
60686	Buffalo Garbage Tankage and Phos.	
62613		R. H. Chrisman, Berea ....
62614		Coffee & Vanhook, Moreland ....
60668	I. A. C. Potato and Truck Grower	Manufacturer ....
60669	I. A. C. H. Gr. Special	Manufacturer ....
60670	I. A. C. Farmers' Best Friend	Manufacturer ....
60671	I. A. C. Phosphate and Tankage	Manufacturer ....
	The Jarecki Chemical Co. (Armour owned), Cincinnati, O.	
62307	Clay Soil Special	
62308	Ammoniated Phosphate	

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
10.45	3.35	13.80		0.98	0.69	1.67	2.03	28.7	62292
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
10.95	2.85	13.80		2.11	1.36	3.47	4.21	41.9	62293
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
16.25	4.95	21.20				0.96	1.17	33.1	62297
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
14.20	0.15	14.35		2.24		2.24	2.72	37.0	60912
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*30.4*	
12.15	1.75	13.90	0.36		0.54	0.90	1.09	25.2	60913 62929
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*24.5*	
11.70	2.00	13.70		1.28	1.78	3.06	3.71	39.8	62363 62932
10.00	*2.00*	*12.00*				*3.29*	*4.00*	*38.8*	
12.25	3.05	15.30	1.10	0.34	0.93	2.37	2.88	36.2	60684
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*34.3*	
14.00	1.60	15.60		0.27	1.36	1.63	1.98	33.1	60685
12.00	*5.00*	*17.00*				*1.65*	*2.00*	*31.6*	
14.95	4.10	19.05				0.43	0.52	27.1	60686 62613
15.75	5.15	20.90				0.45	0.55	28.8	62614
12.50	*4.50*	*17.00*				*0.41*	*0.50*	*23.4*	
10.80	0.80	11.60	1.95	0.60	0.59	3.14	3.81	38.5	60668
10.00	*5.00*	*15.00*				*3.29*	*4.00*	*40.0*	
12.25	3.05	15.30	1.10	0.34	0.93	2.37	2.88	36.2	60669
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*34.3*	
15.65	1.70	17.35				0.88	1.07	30.3	60670
13.00	*5.00*	*18.00*				*0.82*	*1.00*	*27.2*	
15.75	4.50	20.25				0.56	0.68	29.4	60671
12.50	*4.50*	*17.00*				*0.41*	*0.50*	*23.4*	
									62307
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*30.0*	
									62308
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*21.1*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Jarecki Chemical Co.	
62309	Phosphate with Humus	
62629		C. L. and F. F. Dudley, Flemingsburg
62314	Bone Meal and Acid Phosphate	
62784	Ammoniated Phosphate	Manufacturer ....
62855	"X" Bone Meal and Acid Phosphate	Manufacturer ....
	The Kaufman Fertilizer Co. (Armour owned), Cincinnati, O.	
62340	Clay Soil Special	
62341	Ammoniated Phosphate	
62342	Humus Phosphate	
62347	Bone Meal and Acid Phosphate	
62799	Ammoniated Phosphate	Manufacturer ....
62858	"X" Bone Meal and Acid Phosphate	Manufacturer ....
	Ky. Fertilizer Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
62235	O. K. Mixture	Manufacturer ....
62236	O. K. Ammoniated Phosphate	Manufacturer ....
62237	O. K. Special Meal Mixture	Manufacturer ....
62238	O. K. Double-Header Corn and Wheat Grower	Manufacturer ....
62239	O. K. Half and Half Meal Mixture	Manufacturer ....

Acid Phosphates with Nitrogen.

Phosphoric Acid			Nitrogen				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
									62309
14.75	1.60	16.35				0.62	0.75	27.1	62629
12.00	*1.00*	*13.00*				*0.41*	*0.50*	*21.3*	
									62314
10.00	*10.00*	*20.00*				*1.23*	*1.50*	*27.6*	
12.30	2.10	14.40		0.52	0.26	0.78	0.95	24.8	62784
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*24.1*	
13.15	9.45	22.60				0.93	1.13	30.0	62855
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
									62340
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*30.0*	
									62341
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*21.1*	
									62342
12.00	*1.00*	*13.00*				*0.41*	*0.50*	*21.3*	
									62347
10.00	*10.00*	*20.00*				*1.23*	*1.50*	*27.6*	
12.30	2.10	14.40		0.52	0.26	0.78	0.95	24.8	62799
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*24.1*	
13.15	9.45	22.60				0.93	1.13	30.0	62858
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
15.75	5.85	21.60		0.65		0.65	0.79	30.5	62235
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
17.75	2.75	20.50		0.78		0.78	0.95	31.8	62236
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*27.0*	
12.25	7.15	19.40		3.43		3.43	4.16	45.3	62237
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*34.3*	
13.25	9.65	22.90		1.18		1.18	1.43	32.0	62238
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
13.15	9.20	22.35		1.73	0.32	2.05	2.49	37.8	62239
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*30.6*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Co. (Armour owned), Louisville, Ky., Nashville, Tenn., and Cincinnati, O.	
60794	Ky. Corn and Wheat Maker	Manufacturer ....
60795	Special Corn and Tobacco Maker	Manufacturer ....
60796	Ammoniated Phosphate	Manufacturer ....
60804	Kentucky Special	
62653		M. B. Wallingford, Mt. Carmel ......
62939		S. Skaggs, Clarkson ....
60805	Winner	Manufacturer ....
60806	Thomas Crop Grower	
62654		Hill Hardware Co., Bowling Green ...
60815	Half Bone and Phosphate	
63122		F. X. Merkley, Campbellsville ....
63123		Spot Redford, Glasgow ....
62804	Big Vegetable Grower	Manufacturer ....
62813	Tankage and Phosphate	Manufacturer ....
62814	Clay Soil Special	Manufacturer ....
	Morris & Co., Chicago, Ill.	
62442	Special Big Four—Half and Half	
63140		Farmers' Union Supply Co., Franklin.
62449	Special Big Eleven—Phosphated Manure	
62450	Special Big Twelve—Phosphated Manure	

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
11.00	3.20	14.20		0.45	0.55	1.00	1.21	24.8	60794
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*22.3*	
13.05	2.60	15.65		0.38	0.54	0.92	1.12	27.1	60795
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*25.3*	
13.10	2.05	15.15		1.08	0.81	1.89	2.29	33.7	60796
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
									60804
10.85	0.40	11.25				0.44	0.53	19.5	62653
10.40	0.60	11.00	0.21		0.30	0.51	0.62	19.4	62939
10.00	*4.00*	*14.00*				*0.41*	*0.50*	*19.5*	
13.05	3.25	16.30				0.41	0.50	23.8	60805
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
									60806
16.35	0.20	16.55				0.37	0.45	27.2	62654
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*27.0*	
									60815
13.35	8.80	22.15				0.86	1.04	29.6	63122
14.05	7.65	21.70				0.87	1.06	30.2	63123
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
11.90	4.75	16.65		2.36	1.20	3.56	4.32	44.7	62804
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
12.85	5.60	18.45		0.46	0.47	0.93	1.13	28.0	62813
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*25.3*	
13.05	4.35	17.40		1.08	0.75	1.83	2.22	34.1	62814
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	
									62442
13.00	9.00	22.00				1.23	1.49	31.7	63140
13.00						*0.41*	*0.50*	*22.4*	
									62449
10.00	*1.50*	*11.50*				*1.65*	*2.00*	*27.2*	
									62450
12.00	*2.00*	*14.00*				1.65	2.00	30.4	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Mt. Pleasant Fertilizer Co., Inc., Subsidiary of Va-Car Chem. Co., Mt. Pleasant, Tenn.	
62082	Mt. Pleasant Grain Grower	Manufacturer ....
62083	Mt. Pleasant Corn Special	
62675		T. H. O'Bryan, Dawson Springs .....
62084	Black Patch Universal	Manufacturer ....
62088	Mt. Pleasant Burley Tobacco Grower	Manufacturer ....
	Price Chemical Co., Inc., Louisville, Ky.	
62058	H. Gr. Tobacco Bed Special	Manufacturer ....
62059	H. Gr. Fertilizer	Manufacturer ....
62060	Victory Grain Special	Manufacturer ....
62061	No. 1 Fertilizer	
62683		John Middleton, Hodgenville ....
63149		W. W. Ross, Flemingsburg ....
63230		E. T. Walker & Co., Glendale ....
63220	Half Bone and Phosphate	
63232		Mayhew & Gilbert, Franklin ....
	Rasin Monumental Co., Subsidiary of Va-Car Chem. Co., Inc., Cincinnati, Ohio	
62269	Rasin's Fenhumus Fertilizer	Manufacturer ....
62270	Rasin's Grain Fertilizer	Manufacturer ....
62271	Rasin's Special Plant Food	Manufacturer ....
62277	Rasin's Truck and Tobacco Fertilizer	
62689		Martin-Hodgkin Supply Co., Winch'str

Acid Phosphates with Nitrogen.

Phosphoric Acid			Nitrogen				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
11.15	4.95	16.10	0.65		0.48	1.13	1.37	26.6	62082
8.00	*2.00*	*10.00*				*1.23*	*1.50*	*21.4*	
									62083
13.55	3.60	17.15	0.73		0.22	0.95	1.15	28.4	62675
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*24.5*	
13.10	1.60	14.70	1.45			1.45	1.76	30.4	62084
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*27.4*	
14.90	3.50	18.40		1.19	0.37	1.56	1.89	34.7	62088
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*30.4*	
11.25	0.45	11.70	2.41		0.45	2.86	3.47	37.1	62058
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
11.10	0.70	11.80	1.21		0.42	1.63	1.98	28.3	62059
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
15.90	0.40	16.30	0.48			0.48	0.58	27.4	62060
14.00	*4.00*	*18.00*				*0.41*	*0.50*	*25.5*	
									62061
12.90	1.10	14.00	0.46			0.46	0.56	23.0	62683
14.50	2.45	16.95				0.69	0.84	27.6	63149
15.50	2.10	17.60				0.62	0.75	28.4	63230
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
									63220
15.40	5.00	20.40				1.56	1.89	36.0	63232
17.00	*3.00*	*20.00*				*0.82*	*1.00*	*32.4*	
13.95	1.55	15.50				0.66	0.80	26.2	62269
12.00	*1.50*	*13.50*				*0.41*	*0.50*	*21.5*	
16.90	1.10	18.00				1.12	1.36	33.6	62270
13.00	*1.50*	*14.50*				*0.82*	*1.00*	*25.8*	
13.10	1.30	14.40				1.88	2.28	33.3	62271
11.00	*1.50*	*12.50*				*1.65*	*2.00*	*28.7*	
									62277
9.95	0.80	10.75	0.32	1.68	0.75	2.75	3.34	34.5	62689
9.00	*1.50*	*10.50*				*2.47*	*3.00*	*31.4*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Rasin Monumental Co.	
62278	Rasin's Phosphate and Bone Meal	
63163		W. W. Durbin, Clarkson ....
	Read Phosphate Co., Nashville, Tenn.	
60714	Standard Grain Grower	
62694		I. K. Miller & Sons, Campbellsville ..
62695		Barren Co. Grocery and Hdw. Co., Glasgow ....
63167		I. K. Miller & Sons, Campbellsville ..
60727	Red Diamond Favorite	Manufacturer ....
60728	H. Gr. Grain Grower	Manufacturer ....
60729	Bone Mixture	
63171		Barren Co. Grocery and Hardware Co., Glasgow ....
	Smith Bros., New Albany, Ind.	
62040	Corn and Wheat Grower	
62705		R. M. Smith, Lagrange ....
62950		J. B. Jacobs, Grayson ....
63173		Jenkins, Essex Co., Elizabethtown ...
62041	Tankage and Phosphate	Manufacturer ....
	St. Bernard Fertilizer Co., Nashville, Tenn.	
60765	H. Gr. Grain Grower	Manufacturer ....
60766	Standard Grain Grower	Manufacturer ....
	St. Matthews Produce Exchange, St. Matthews, Ky.	
62357	Potato Grower	
62711		Manufacturer's warehouse ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
									62278
11.60	13.10	24.70				0.77	0.93	28.0	63163
10.00	*12.00*	*22.00*				*0.82*	*1.00*	*25.5*	
									60714
12.90	8.60	21.50		0.24	0.21	0.45	0.55	25.9	62694
12.95	5.45	18.40				0.66	0.80	26.2	62695
12.45	4.00	16.45				0.52	0.63	23.9	63167
12.00	*7.00*	*19.00*				*0.41*	*0.50*	*23.7*	
14.00	3.30	17.30	1.40	0.37	0.36	2.13	2.59	37.2	60727
12.00	*5.00*	*17.00*				*1.65*	*2.00*	*31.6*	
16.15	2.20	18.35		0.66	0.45	1.11	1.35	32.9	60728
16.00	*2.00*	*18.00*				*0.82*	*1.00*	*30.5*	
									60729
12.90	8.25	21.15				0.95	1.15	29.3	63171
13.00	*7.00*	*20.00*				*0.82*	*1.00*	*28.0*	
									62040
12.20	1.65	13.85				0.98	1.19	25.8	62705
13.15	1.05	14.20				0.87	1.06	26.2	62950
12.60	0.65	13.25				0.78	0.95	24.6	63173
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*24.5*	
11.30	0.25	11.55		2.36	0.29	2.65	3.22	35.6	62041
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*27.4*	
16.15	2.20	18.35		0.66	0.45	1.11	1.35	32.9	60765
16.00	*2.00*	*18.00*				*0.82*	*1.00*	*30.5*	
14.10	4.30	18.40	0.35		0.37	0.72	0.87	27.9	60766
12.00	*7.00*	*19.00*				*0.41*	*0.50*	*23.7*	
									62357
11.70	1.90	13.60	1.92		0.95	2.87	3.48	38.4	62711
10.00	*2.00*	*12.00*				*3.29*	*4.00*	*38.8*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Swift & Co., Inc., National Stock Yards, Ill.	
60782	Swift's Blood and Phosphate	Manufacturer
60783	Swift's Corn and Oats Special	
62957		Lewisport Milling Co., Lewisport
60784	Swift's Tankage and Bone Phosphate	
62719		J. F. Collings, Shepherdsville
62720		E. M. Ford & Sons, Cave City
63180		John B. Marriott, Cecilia
60788	Swift's Bone Meal and Phosphate Fertilizer	
63182		W. S. Overstreet, Lagrange
63183		Young & Bishop, Providence
	Taylor & Powell Fertilizer Co., Springfield, Tenn.	
62461	No. 4 Tobacco Grower without Potash	Manufacturer
	Tenn. Chem. Co. (Armour owned), Louisville, Ky.; Nashville, Tenn., and Cincinnati, O.	
60827	Ox Kentucky Special	Manufacturer
60828	Ox Winner	
62722		Wilson-Wyne & Co., Russellville
60829	Ox Animal Tankage and Phosphate	Manufacturer
60836	Ox Special Corn and Tobacco Maker	Manufacturer
60840	Ox Ammoniated Phosphate	Manufacturer
60845	Ox Half Bone and Phosphate	Manufacturer
62839	Ox Harvester	Manufacturer
62840	Ox Ammoniated Phosphate	Manufacturer

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
14.45	2.10	16.55				1.77	2.15	34.9	60782
12.00	*3.00*	*15.00*				*1.65*	*2.00*	*30.8*	
									60783
9.90	4.00	13.90		1.17	0.42	1.59	1.93	27.6	62957
10.00	*3.00*	*13.00*				*1.65*	*2.00*	*27.8*	
									60784
14.55	3.35	17.90		0.41	0.58	0.99	1.20	30.1	62719
13.45	3.05	16.50		0.39	0.51	0.90	1.09	27.7	62720
13.45	2.85	16.30		0.31	0.36	0.67	0.81	26.0	63180
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*24.9*	
									60788
14.75	7.05	21.80				0.93	1.13	31.5	63182
14.75	6.70	21.45				0.86	1.04	30.8	63183
13.00	*7.00*	*20.00*				*0.82*	*1.00*	*28.0*	
11.75	3.70	15.45	3.13			3.13	3.80	41.0	62461
10.00						*2.47*	*3.00*	*32.3*	
10.65	3.95	14.60				0.50	0.61	21.1	60827
10.00	*4.00*	*14.00*				*0.41*	*0.50*	*19.5*	
									60828
14.45	3.05	17.50		0.32	0.21	0.53	0.64	26.6	62722
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.5*	
14.70	2.80	17.50				0.46	0.56	26.4	60829
14.00	*4.00*	*18.00*				*0.41*	*0.50*	*25.5*	
13.05	2.60	15.65		0.38	0.54	0.92	1.12	27.1	60836
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*25.3*	
13.10	2.05	15.15		1.08	0.81	1.89	2.29	33.7	60840
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*28.2*	
18.00	5.75	23.75				0.87	1.06	35.4	60845
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*24.7*	
13.25	4.95	18.20		0.51	0.38	0.89	1.08	28.1	62839
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*25.3*	
13.95	4.50	18.45		1.15	0.60	1.75	2.12	35.0	62840
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*31.2*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Tenn. Chemical Co.	
62846	Ox Big Vegetable Grower	Manufacturer ....
	Victor Guano Co., Nashville, Tenn.	
60752	H. Gr. Grain Grower	Manufacturer ....
60753	Standard Grain Guano	Manufacturer ....
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.	
62251	V-C Richumus Fertilizer	
62747		A. L. Moore, Leitchfield ....
62963		Patrick Dillon, Hardinsburg ....
62252	V-C Sure Grain Producer	
62964		A. L. Moore, Leitchfield ....
62253	V-C Rescue Fertilizer	Manufacturer ....
62259	V-C Tobacco Plant Food	
62753		Mt. Sterling Commission and Storage Co., Mt. Sterling ....
62754		Silas Shelburn, Lexington ....
62261	V-C Bone Meal and Phosphate	
62757		Taylor County Supply Co., Campbellsville ....
	Wood, Stubbs & Co., Store, Inc., Louisville, Ky.	
62069	Acme A-1 Fertilizer	Manufacturer ....
62070	Acme H. Gr. Vegetable Grower	Manufacturer ....

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN						
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	Index of Relative Value	Station Number
11.75	4.10	15.85		2.12	1.40	3.52	4.27	43.9	62846
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*39.6*	
16.15	2.20	18.35		0.66	0.45	1.11	1.35	32.9	60752
16.00	*2.00*	*18.00*				*0.82*	*1.00*	*30.5*	
14.10	4.30	18.40	0.35		0.37	0.72	0.87	27.9	60753
12.00	*7.00*	*19.00*				*0.41*	*0.50*	*23.7*	
									62251
15.00	1.15	16.15				0.47	0.57	26.3	62747
13.10	1.50	14.60				0.61	0.74	24.5	62963
12.00	*1.50*	*13.50*				*0.41*	*0.50*	*21.5*	
									62252
14.20	1.65	15.85		0.38	0.41	0.79	0.96	27.5	62964
13.00	*1.50*	*14.50*				*0.82*	*1.00*	*25.8*	
13.10	1.30	14.40				1.88	2.28	33.3	62253
11.00	*1.50*	*12.50*				*1.65*	*2.00*	*28.7*	
									62259
10.15	1.75	11.90		1.78	0.83	2.61	3.17	34.2	62753
9.25	2.30	11.55	0.39	1.43	0.87	2.69	3.27	33.6	62754
9.00	*1.50*	*10.50*				*2.47*	*3.00*	*31.4*	
									62261
12.00	14.00	26.00				1.06	1.29	31.0	62757
10.00	*12.00*	*22.00*				*0.82*	*1.00*	*25.5*	
13.50	0.55	14.05	1.40		0.29	1.69	2.05	32.3	62069
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*30.4*	
10.75	0.40	11.15	2.53		0.63	3.16	3.84	38.4	62070
10.00	*2.00*	*12.00*				*3.29*	*4.00*	*38.8*	

TABLE VI.—NITROGEN SALTS.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	NITROGEN	Equivalent to Ammonia	Index of Relative Value	Station Number
60854	**Armour Fertilizer Works, Louisville, Ky., Nashville, Tenn., and Cincinnati, O.** Armour's Nitrate of Soda	Manufacturer	15.06 *14.81*	18.27 *17.98*	105.4 *103.7*	60854
62362	**International Agr'l Corp., Inc., Cincinnati, O.** Nitrate of Soda	Manufacturer	16.08 *15.00*	19.52 *18.20*	112.6 *105.0*	62362
60801	**Louisville Fertilizer Co. (Armour owned), Louisville, Ky.; Nashville, Tenn. and Cincinnati. O.** Nitrate of Soda	Manufacturer	15.06 *14.81*	18.27 *17.98*	105.4 *103.7*	60801
60824	**Tenn. Chem. Co. (Armour owned), Louisville, Ky.; Nashville, Tenn. and Cincinnati, O.** Ox Nitrate of Soda	Manufacturer	15.06 *14.81*	18.27 *17.98*	105.4 *103.7*	60824

TABLE VII.—POTASH SALTS.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Potash, from Muriate	Potash, from Sulfate	Index of Relative Value	Station Number
	International Agr'l Corp., Inc., Cincinnati, O.					
62368	Muriate of Potash	Manufacturer	50.12 *50.00*		200.5 *200.0*	62368
62369	Sulphate of Potash	Manufacturer		51.32 *50.00*	205.3 *200.0*	62369

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VITALITY OF SPERMATOZOA

BULLETIN NO. 239

(Research Bulletin)

Lexington, Ky.
January, 1922

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BULLETIN NO. 239

(Research Bulletin)

Vitality of Spermatozoa

By

W. S. ANDERSON

I. The Vitality of the Spermatozoa of Some Domestic Animals.

INTRODUCTION.

Kentucky has been noted for its blooded stock ever since the importation of Shorthorn cattle in 1817 and the importation of jack stock, swine and cattle by Henry Clay a few years later. The American saddle and show horse originated in Kentucky and the breeders of Kentucky exercised a major influence in founding and developing the Standard-bred, or trotting horse. No other state has made greater contributions to the evolution of the Thorobred Horse than has Kentucky. Some of the finest and best-equipped farms of the State are now devoted exclusively to breeding purebred horses, cattle, hogs or sheep.

The paramount problem of animal breeding is to get the females bred to produce. A very serious financial loss is sustained each year by our breeders because from 30 to 60 per cent. of mares and a considerable number of the most valuable females of other breeds fail to produce.

In 1913 a study of some of the problems of animal breeding was begun by the Kentucky Experiment Station. The investigations had not progressed very far until it became apparent that the vitality of the spermatozoa was one of the important phases of the investigation. As a result considerable time has been devoted to a study of the vitality of the male sex cells, not only of domestic animals but also of some of the lower forms of animal life.

The investigation concerning the behavior of spermatozoa has been made for two purposes. One purpose has been to add, if possible, to our knowledge of the male sex cells; the other is that this knowledge may throw some light upon the problems of the horse, hog and cattle breeder. It is the purpose of this bulletin to report some of the work done to this date.

THE SEMEN

The Origin of the Semen. The spermatozoa of mammals are transferred from the male gonads to the genitalia of the female by means of a liquid called semen. The sperm as matured in the testes are washed out of the tubules into the duct leading to the epididymis and vas deferens by a small quantity of a liquid of a whitish or milky appearance. The liquid carries them into the vas deferens. At the time of ejaculation, the fluids secreted by the prostate gland and Cowper's glands are mixed with those held in the seminal vesicles and the vas deferens, and the discharge is known as semen. Thus, the semen is a combination of the secretions of various glands, and is the medium in which the sex cells of the male are stored and in which they are conveyed to the womb of the female.

The Importance of the Semen. The writer has found that the vitality of the spermatozoa can be injured by any radical change in the medium which contains them. Perhaps, it is correct to refer to normal semen as that semen which has the best physical and chemical constitution possible for the welfare of the sperm cells. Abnormal semen is a semen which lowers the vigor of the sperm in any way whatever. In our investigations, semen has been obtained in which the sperm cells were without life, and other samples showed various degrees of vigor from the quiescent state of some to the very active condition of normal sex cells.

The Chemical Composition of Semen. Slowtzoff[1] reports that human semen consists of approximately 90 per cent of water and 10 per cent of solids. Marshall[2] states that in the solids there is 2.3 per cent proteins, and that in the ash potassium, sodium, calcium, magnesium, prosphorus, iron and sulfur have been found.

Dr. A. M. Peter[3] reports that normal horse semen is 97.62 per cent water and 2.38 per cent solids, and that nitrogen and phosphorus in considerable quantities are present in the solids and that of the total solids more than 60 per cent is protein.

THE SPERMATOZOA

The only contribution which a stallion, or any male animal, makes to one of his offspring is a sex cell known as a spermatozoon. All the hereditary material which the male hands on to any decendant must be included in the one sex cell of his which finds and fuses with the egg of the female. The spermatozoa have two distinct functions to play in the process of reproduction. One office is to initiate development in the egg; the other value of the spermatozoa is to carry to the egg the hereditary contribution of the male to the new organism that is to develop from the fertilized egg.

Morphology of Spermatozoa. The spermatozoon of the stallion, when fully mature, consists of a head, middle piece and tail. The sperm moves by the vibratory motion of the tail and its function ends when the sperm is brought into contact with the egg; it does not always penetrate the egg but may be left behind when the head enters the cell wall of the egg.

The head of the spermatozoon of the stallion, which is somewhat similar to the sperm of most domestic animals, is oblong, or pear-shaped, and appears blunt at the end. When stained it is found to consist of chromatin, or material carrying the hereditary factors, with little or no cytoplasm, or food material.

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[1] Slowtzoff, 1902, Zeitschrift. Phys. Chem.

[2] Marshall, 1910, Physiology of Reproduction.

[3] Anderson, Peter & Healy, 1921, Journal American Veterinary Medical Association, December, 1921, pp. 291-297.

The head is 3 microns in length and one and one-half microns in width while the tail is 24 microns in length. Fig. 2.

The spermatozoa of bulls are similar in outline to those of the horse, but are larger. The head is pear-shaped and blunt. The measurements are: 5 microns for length of head, 2 microns in width, and 32 microns for the length of tail. Fig. 3.

The spermatozoa of the rooster are shown as a contrast to those of mammals. The head is long and round but it is blunt. It is 12 microns in length and 1 micron in width while the tail is 40 microns in length. The tail even under a power of over a thousand diameters is hair-like in width and does not show any distinct middle piece or connecting piece, nor can a distinct end piece so often described by authors be seen. Fig. 4.

The spermatozoon of man is not very different from that of the horse, except that the head is more ovoid. The head is oval or pear-shaped, and blunt. There is no acrosome, or stylet, for the purpose of penetrating the egg, as has been described by some authors. There is, however a connecting piece or middle piece. The measurements are: length of head 3 microns, width of head 2 microns, length of tail 24 microns. The connecting piece is approximately 3 microns in length. When stained with gentian violet the head shows two distinct parts. The anterior division composing about two-thirds of the head is light, while the posterior portion is dark. The anterior end is known as the perforatorium and is the part of the spermatozoon which first enters the egg. Fig. 1.

The measurements as given above and the diagrammatic drawings of the various spermatozoa shown in the figures were made from the broad view of the heads. The heads of spermatozoa are slightly flat so that there is another view that would make the head appear not as large by about one-half a micron as the broad view.

Origin of the Spermatozoa. The function of the reproductive glands or testicles, is to mature the spermatozoa. This the testicles do in very large numbers. The process of production of germ cells is called ''maturation.'' When the sexual maturity of an animal is complete the reproductive glands begin to mature sex cells by transforming one gland cell into four sex cells. As a preparation for the maturation process a gland cell enlarges, or grows to a greater size than the other gland cells. This is its method of storing food for the processes, or divisions, that are to follow. It divides into two equal halves, separating itself as it does so from the other gland cells. Both the new cells immediately divide again, one-half of the bodies carrying the hereditary factors going into each of the new cells. The four new cells are attached to a nurse cell, called a Sertoli cell, to which they cling until the head, middle piece and tail are fully developed. They then drop away from the nurse cell into the tubule, or small passage, of the testicle and with many others similarly produced are sent on to the vas deferens.

Little or no activity is manifested by the spermatozoa as they pass down the tubules of the testicles or as they go on thru the epididymis and sperm cord.

Number of Spermatozoa. It will be observed that one testicle cell goes thru a process of maturation and produces four functional sex cells. The discharge of a vigorous stallion may contain more than two hundred million spermatozoa and he can make such a rich discharge every day or twice a day for a considerable period. The sex cells are matured very rapidly and in very great numbers. Millions of testicle cells must be constantly going thru the process of converting themselves into spermatozoa during the breeding season. The testicles retain their normal size by replacing the lost cells by the ordinary process of cell growth.

Motility of Spermatozoa. The spermatozoa are immobile, or at least manifest but little activity, while in the tubules, cords and seminal vesicles. It requires the contributions from the accessory sex glands, Cowper's and the prostate, added to that of the seminal vesicles during the act of ejaculation to activate them. The normal secretions of the mucus membrane of the womb have the activating effect; and the same result can be obtained by means of a physiological salt solution.

The natural rate of movement of spermatozoa is rapid and is against the current. If in the semen on a microscope slide, a current is set up, the vigorous sperm immediately change their seeming wandering movements to a direction opposite to the current or "upstream." This is nature's provision to secure the passage of the sperm cells thru the uterus and tubes against the current flow of the natural secretions on the membranes.

Some investigators suggest that one function of the semen is to furnish food for the spermatozoa. When the maturation process is complete and the sperm cells are freed from the nurse cells of Sertoli, it is not probable that they receive, or can make use of, any food during the remainder of their life history.

By experimental work reported in this bulletin it has been found that the addition of very slight amounts of acids or alcohols to the semen of mammals injures the spermatozoa. It seems reasonable to assume that the chemical constitution of the semen of sterile males may be, in some cases, the cause of injury to the spermatozoa.

EXPERIMENTAL WORK

The Normal Activity of the Spermatozoa of the Stallion. In the routine of horse breeding it is easy to procure semen as the stallion completes his work. The condition of the sperm cells is determined by the vigor of action, or rate of movement. A small portion of the liquid is placed on a glass slide and the movement of the reproductive cells is studied under the microscope. By using a No. 10 eye piece and a 16 mm. objective a magnification of about 100 diameters is obtained. This magnification affords an excellent field for observing the vigor of the cells.

The Normal Field. It may be said that semen from an animal in full sexual vigor will show a field full of sperm all of which will be active. The eye soon becomes accustomed to the observation and can tell immediately if the rate of movement is as rapid as it should be. It has been estimated that the maximum rate of progress across a field is between 3 and 4 mm. per minute. There is in practis no accurate method of determining the absolute rate of travel, nor is such determination necessary. The essential facts to be ascertained by the observer are the comparative number of sperm in the semen and if all of them are moving with normal vigor.

The number in the field of good specimens is very much greater than a layman would suppose possible. The semen of Etawah, a Standardbred horse, for example, is so crowded with sperm that there appears to be no appreciable space between them. The field reminds the observer of a school of tiny fish feeding in the aquarium of a fish hatchery.

The Abnormal Field. The presence of any inactive sperm is a cause for suspicion. Males have been under observation a part of whose sex cells were inactive, or dead. When the number of dead cells from a male reaches any considerable proportion it is invariably an indication that a large percentage of the females mated to him will not conceive.

The presence of inactive or dead cells in semen is an indication, also, of a lack of vigor in the live ones. The weakness may manifest itself in a sluggish movement, or it may make itself apparent by a premature ending of motility. A male producing such a specimen of semen is either sterile or approaching that condition.

There is a class of males whose semen shows an abundance of sperm, but all of them are inactive. It is, of course, impossible for such males to procure offspring.

Another abnormal field is one in which no spermatozoa, dead or alive, are to be seen. In this investigation a much larger percentage of males were found in this sterile condition than would have been expected.

As the previous paragraphs indicate, a sire's ability to produce offspring can be judged very accurately by examining drops of semen with a microscope. Early in the investigation it seemed worth while to subject normal semen to certain tests in the laboratory.

THE LENGTH OF LIFE OF THE SPERMATOZOA OF THE HORSE.

To discover the life history of the sperm in the semen after ejaculation, samples were procured on the breeding farms, a drop at once examined to determine its condition and the liquid semen placed in a sterile glass tube and taken to the laboratory, the time of mating being noted so that all subsequent observations could be dated from the time of ejaculation.

For the purposes of this bulletin the tables are omitted and the average results of 24 specimens of normal horse semen given for length of life under laboratory conditions.

1. Semen containing vigorous spermatozoa, kept in glass test tubes at a temperature of 22° C., shows loss of movement in two hours and a progressive loss until all are dead at the end of six hours on the average.
2. Other portions of semen kept in the incubator at 38° C. show loss of movement in somewhat less than two hours and total loss of movement in four hours on the average.

Under normal laboratory conditions semen cannot be kept an indefinite time as is supposed to be possible. The loss of vigor is distinct after the lapse of two hours; and it is probable that the ability of the sperm cells to fertilize eggs is lost before the decrease in vigor can be discovered by the observer.

An interesting result was obtained by contrasting the length of the duration of activity at the average laboratory temperature of 22° C. and that of an incubator at 38° C. or about animal heat. When the temperature is kept at 38° C. movement of the spermatozoa did not extend beyond four hours, or two hours less than at the temperature of 22° C. The reason for this difference is the more rapid multiplication of bacteria at 38° C. than at 22° C. Counts made of the bacteria after three hours at the higher temperature have run as high as 5,500,000 per c. c.

It is supposed that semen can be carried in a thermos bottle at 38° C. for many miles and used effectively. The writer has had inquiries as to the method of transporting it for hundreds of miles and even from one continent to another. It must be used, if used at all, very quickly after it has been ejaculated by a stallion. Perhaps 25 or 30 minutes is the utmost time it can with safety be kept and used.

This will be apparent when it is remembered that the albuminous character of the liquid semen makes it an ideal medium for the growth of bacteria, and there is no known way of procuring semen from a stallion that is not more or less contaminated by certain forms of bacteria that in six or eight hours give the distinct odor of putrefaction. All movement ceases before the first odor of putrefaction can be detected.

3. To test the effect of light upon the life of the spermatozoa samples of semen were divided into two portions, one of which was kept in the laboratory exposed to the light, while the other portion was kept in a dark incubator. The temperature of the incubator was regulated so that it corresponded exactly with the room temperature which was in this case 21° C. In all the trials of this nature the progressive loss of life was the same in the semen kept in darkness as that kept in light. The experiments prove that light has no perceptible effect upon the life of the sex cells.

The opinion held by most breeders is that light is injurious to the sperm cells, and that semen must be protected from the light if injury is not to result. Our work shows conclusively that light has no appreciable effect.

4. To determine the effect of sunlight on the movement of Spermatozoa the test on a sample of semen is given. This is typical of all other trials.

10:00 A. M. Semen placed in sunlight, temperature 38° C.
10:10 A. M. All sperm active.
10:20 A. M. All sperm very active.
10:30 A. M. All sperm very active.
10:40 A. M. ¼ sperm inactive. ¾ very active.
10:50 A. M. ¼ sperm inactive. ¾ very active.
11:00 A. M. ½ sperm inactive. ½ very active.
11:10 A. M. 2/3 sperm inactive. 1/3 very active.
11:20 A. M. 2/3 sperm inactive. 1/3 verty active.
11:30 A. M. Very little activity.
11:40 A. M. No activity.

Sunlight appears to have a stimulating effect upon the spermatozoa and the movement as a result of the sun's rays seems to be more vigorous. The increased vigor however results in lessening the time of the activity. Movement of the sperm cells ceases in less than two hours when the semen is kept in sunlight at a temperature of 38° C. whereas they live four hours at the same temperature in either the light of the laboratory or the darkness of an incubator.

5. The following tests were made to determine the effect of extreme temperature on the life of the spermatozoa in semen procured at 10 A. M. and taken to the laboratory at 11 A. M.

A—11:05 A. M. Semen raised in test tube to 40° C. All active.

11:10 A. M. Semen raised in test tube to 43° C. All active.

11:18 A. M. Semen raised in test tube to 44° C. A few not active.

11:28 A. M. Semen raised in test tube to 46° C. Slight activity.

11:35 A. M. Semen held in test tube to 46° C. No activity.

B—11:42½ A. M.	Semen raised to 46°	All active
11:47½		All active
11:55		About 10% inactive
12.05		About 15% inactive
12:15		About 25% inactive
12:25		About 95% inactive
12:30		About 95% inactive
12:35		All inactive

In testing semen for the resisting power of the sperm to extreme temperature two types of experiments were performed, as indicated by A and B above. In A the semen was gradually increased in temperature to 46° C. or approximately 115° F. No inactivity was noted below the temperature of 44° C.

In B the semen was raised to 46° C. at once and held at that temperature. In twelve and one-half minutes inactive sperm were seen and in approximately 50 minutes all became quiescent.

From these observations on the persistence of the life of the sperm it will be seen that some of them can live in temperatures as high as 46° C. for some time and a very few as long as 45 or 50 minutes.

6. To test the effect of extreme cold, semen in test tube was lowered to 0° C. and held.

11:00 A. M.	All active
11:10	All active
11:20	25% inactive.
11:30	50% inactive
11:40	50% inactive
11:50	75% inactive
12:00	75% inactive
12:10	95% inactive
12:20	98% inactive
12:30	Some evidence of life.
12:40	Slight evidence of life.
12:50	No activity.

It takes over one hour and forty minutes at 0° C. to render spermatozoa inactive.

7. To test the effect of freezing on the spermatozoa, a test-tube containing semen was placed in a mixture of salt and ice and slides examined after ice began to form in the tube. There was some movement of the cells as long as any unfrozen semen could be obtained. After the semen was frozen solid it was allowed to melt at room temperature; but there was no activity shown by the cells. By placing the test tube in warm water the temperature was raised to 35° C. and then to 40° C. but no evidence of motility was obtained.

The semen was then divided into two portions. Into one a physiological salt solution was poured, while the other portion received a 1 per cent potassium iodide solution. No evidence of life was found in either portion of semen.

It appears that the sperm cell of the horse will exhibit activity in great extremes of temperature, from 0° C. to 46° C; but when made quiescent by heat or cold there is no way known to the writer of starting movement again.

THE LENGTH OF LIFE OF THE SPERMATOZOA OF THE ROOSTER.

A vigorous White Wyandotte cock was used in a pen of birds during the breeding season of 1921 for the purpose of determining his ability to fertilize eggs. He fertilized 85 per cent of all the eggs tested from his pen of hens.

At 7:30 A. M., June 8th, he was destroyed and his testicles and cords carefully removed from his body. From one testicle was taken a small amount of liquid. The milky appearing liquid contained inactive spermatozoa in very great numbers. Activity was aroused by diluting on the slide the liquid from the testicle by a physiological salt solution. Other trials showed that the inactive sperm from the testicles could be activated by diluting with water.

Examination of sperm cords of other birds during the breeding season shows that as the spermatozoa of the rooster approach the outlet of the cord some motility can be observed, but that in the main the semen must in the course of nature come in contact with the secretions of the vagina of the female bird to be fully activated.

To determine the length of life of the spermatozoa of the rooster destroyed at 7:30 the following tests were made:

A—At 10:00 A. M. the liquid semen of one cord was pressed out and placed in 2 c. c. of physiological salt solution.

10:00 A. M.	All the sperm were active.
10:30	All the sperm were active.
11:00	All the sperm were active.
12:00	All the sperm were active.
2:30 P. M.	Diminished activity.
3:30	Greatly diminished activity.
5:00	Little evidence of activity.

At 9 A. M. of the following day, a drop of the solution showed marked degeneration of the sperm. The flagellum had disappeared and the head was greatly swollen. At 9 A. M. of the third day the degeneration of the sperm was complete.

B.—One testicle of the rooster used in A was placed, at 9 A. M. of the day it was released from his body, in a physiological solution of salt and transferred immediately to the ice box.

At 9 A. M. of the third day, the sperm had degenerated.

It will be noted that the duration of life of the sperm cells of a rooster is not different from that of the horse.

The semen procured from boars and bulls has been tested for the duration of life in the sperm cells and found to resemble very closely that of the horse.

THE EFFECT OF ACIDS ON THE SEPERMATOZOA OF MAMMALS.

In the progress the investigation semen has been procured from stallions, boars and bulls at various times in which the spermatozoa exhibited all the different degrees of movement from the most vigorous action to the absence of all movement. We have had the opportunity to observe the activity of the sperm cells of a large number of males and to ascertain the power of these males to produce impregnation in the females to which they were mated. It may be stated as a general rule that any given male will lack the power of impregnation if the spermatozoa in his semen are wanting to any considerable extent in activity or vigor of movement.

Trials were made in the laboratory by the use of small quantities of acids added to semen containing vigorous sperm, to bring about a lack of vigor in the cells. It was found that every degree of abnormality could be produced from slight to fatal injury.

A typical example is:

Normal semen treated with .36% solution of HCl. No activity of sperm.

Normal semen treated with .18% solution of HCl. No activity of sperm.

Normal semen treated with .09% solution of HCl. No activity of sperm.

Normal semen treated with .045% solution of HCl. No activity of sperm.

Normal semen treated with .0225% solution of HCl. Slight activity.

Normal semen treated with .01125% solution of HCl. More activity.

Normal semen treated with .00565% solution of HCl. Almost normal activity.

In the above treatment of semen with acid, a measured quantity of HCl was added to a measured quantity of semen.

The percentage was calculated as tho a c. c. of semen were equal to a c. c. of distilled water. Later Healy and Anderson[3] found that semen is buffered against acids and alkalies to a certain extent, so that the percentages of free acid as given above are not absolute. A slightly smaller percentage of free acid, due to the buffer effect of the semen, should be kept in mind as the results of this experiment are interpreted.

In addition to HC1, as given above, H_2SO_4 and HNO_3 were tried with like results. A .045% solution of either H_2SO_4 or HNO_3 was a sufficient concentration of the acids to destroy all evidence of activity on the part of vigorous spermatozoa. $C_2H_4O_2$ and C_6H_5OH gave the same results when brought in contact with the sperm cells in the same degree of concentration.

It is remarkable how little resistance the sperm of mammals have to acids. There is no difference which the writer has been able to discover between the strengths of acid dilutions necessary to destroy the sperm of horses, hogs, bulls, rabbits, guinea-pigs and rats and even that of the rooster made active in physiological salt solution.

THE EFFECT OF POTASSIUM PERMANGANATE ON SPERMATOZOA.

Normal semen of the horse treated with 1.0% $KMnO_4$. No activity of sperm.

Normal semen of the horse treated with .5% $KMnO_4$. No activity of sperm.

Normal semen of the horse treated with .25% $KMnO_4$. No activity of sperm.

Normal semen of the horse treated with .0675% $KMnO_4$. No activity of sperm.

Normal semen of the horst treated with .0675% $KMnO_4$. Slight activity sperm.

Normal semen of the horse treated with .03375% $KMnO_4$. More activity.

Normal semen of the horse treated with .016875% $KMnO_4$. Almost normal activity.

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[3] Healy, D. J., and Anderson, W. S., loc. cit.

THE EFFECT OF ETHYL ALCOHOL ON SPERMATOZOA.

Normal semen of the horse treated with 1.0% C_2H_5OH. No activity.

Normal semen of the horse treated with .5% C_2H_5OH. No activity.

Normal semen of the horse treated with .25% C_2H_5OH. Slight activity.

Normal semen of the horse treated with .125% C_2H_5OH. Almost normal activity.

As in the case of acid the percentage of the solution was calculated by considering one c. c. of semen as equal to a c. c. of distilled water.

A very weak dilution of $KMnO_4$, or .0675 per cent is sufficient to fatally injure the sperm. It requires a much greater concentration of C_2H_5OH, or .25%, to cause as serious an injury.

DIFFERENCE IN VIGOR OF SPERMATOZOA.

One of the most interesting features of the investigation has been the difference in the vigor of individual cells. Fields have been under observation when the concentration of some chemical substance had quieted all but one or two spermatozoa. These would be moving about with rapidity, going over and around the dead cells as tho they themselves were unaffected by the hostile chemical. The same difference is seen in individual behavior of the cells when semen is subjected to the different temperatures or in tests for length of life. Some few vigorous ones always show considerable vigor after the vast majority have succumbed to the adverse environment.

The same phenomenon is observed in examining the genitalia of bred females. Often when the great majority of the male sex cells have ceased to move on the mucous membrane an occasional sperm is found with considerable vigor of movement.

It has not been determined whether the most vigorous spermatozoa are due to age or to inherent vigor; nor has it been determined what difference, if any, there would be in organisms arising from eggs fertilized by the most vigorous sperm and those fertilized by the weakest.

HYDROGEN ION CONCENTRATION OF HORSE SEMEN.

There are stallions whose semen invariably contains a large number of inactive sperm cells. In some samples of abnormal semen more than one-half the spermatozoa are quiescent. The stud records of these horses show them to be partially sterile as the ones under observation impregnate from 20 to 40 per cent of the mares mated to them.

Such a large number of abnormal specimens of semen have been obtained that it occurred to the writer that there might be some difference in the acid or alkali concentration of normal and abnormal semen.

The proposition was placed before Dr. D. J. Healy of this Station and he kindly consented to determine the hydrogen ion concentration of a number of samples of normal and abnormal horse semen.

Horse semen is neutral, as far as any test with litmus paper can be made, and no difference can be seen in normal and abnormal semen by the use of litmus paper. Dr. Healy says in reporting the result of the hydrogen ion measurement:

''Living cells require the maintenance of a strictly limited hydrogen ion concentration in their environment. Enzymes are extraordinarily sensitive to minute changes in the hydrogen ion concentration of the medium in which they are working. Fortunately, protoplasm contains salts of carbonic and phosphoric acids which act as 'buffers' checking changes in hydrogen ion concentration, the bicarbonate acting by releasing or absorbing CO_2, while the phosphates readily change from mono — to diphosphate and vice versa.

''Two methods are available for the measurement of hydrogen ion concentration in solution—the colormetric and the electrometric.

''The apparatus used in this investigation consisted of the Clark hydrogen ion apparatus supplied by Leeds and Northrup Company, a portable lamp and scale galvanometer, a Leeds and Northrup type K potentiometer and a standard Weston cell, Model 4.''

The Semen used. The semen used for the investigation was procured from stallions in service. All the stallions whose semen was found to be normal—that is, full of very active spermatozoa, as shown by the microscope—have excellent records in the stud for getting a high percentage of their mares in foal. On the other hand, the semen which showed a large percentage of dead cells came from stallions that impregnated a smaller percentage of their mares.

Manner of Obtaining Semen. The semen was collected as the stallion made a service. As he came down a sterile, stoppered funnel was used to catch the semen which was transferred to a sterile bottle and taken as quickly as possible to the laboratory. About an hour, on the average, elapsed after collecting the semen before the measurement was made.

As soon as the semen was obtained, an examination was made of a drop under the microscope and it was re-examined after arriving at the laboratory. The following results were obtained in making the measurements of normal horse semen.

Table 1. Normal Semen.

Stallion	Time	Reading	Temp.	pH Value
1. Etawah	10.11	.7335 volts	26.5° C.	7.43*
2. Huon	9.47	.7230 volts	23.5° C.	7.44
3. Uncle	10.03	.7255 volts	23.5° C.	7.47
4. Rapid Water	11.13	.7080 volts	19.5° C.	7.14*
9. Prince Palatine	9.20	.7010 volts	23.5° C.	6.94*
12. Fritter Gold	9.38	.7325 volts	22.0° C.	7.51*
14. Fair Play	11.40	.7180 volts	29.0° C.	7.24
			Average	7.31

The range of the seven specimens of normal horse semen is from pH 6.94 to 7.51 or an average of pH 7.31. This finding may be compared to the pH value of blood which is pH 7.40, almost identical with that of semen.

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*Correcion for flushing out hydrogen vessel with CO_2-free water, .125 pH has been deducted.

Table 2. Semen containing non-motile Spermatozoa.

Stallion	Time	Reading	Temp.	pH Value
5th.	8.50	.7280 volts	19.5° C.	7.49*
6th.	9.17	.7320 volts	19.5° C.	7.55*
7th.	9.07	.7280 volts	22.5° C.	7.55
8th.	9.23	.7300 volts	22.5° C.	7.58
13th.	9.47	.7480 volts	22.5° C.	7.76*
			Average	7.58

The range of the abnormal semen is from pH 7.49 to pH 7.76, while the average is pH 7.58 as contrasted with pH 7.31 for normal semen. The difference, therefore, is .27 of a pH value.

We realize that not enough work has yet been done to draw any very definite conclusion. It does not seem possible that a slight difference of .27 of a pH value can be the cause of the sperm cells loosing the ability to move, but earlier experiments show that they are very sensitive in the presence of some acids.

To determine if the hydrogen ion concentration of semen is readily altered we made this experiment. To a 10 c. c. portion of semen of pH 7.56, 0.5 c. c. N/10 HC1 was added. Then the hydrogen ion concentration was measured. The acid added made a reduction from pH 7.56 to pH 7. CO_2 free water of pH 5.6, with the same treatment is reduced to pH 2.25. In view of the quantity of an acid or an alkali necessary to produce a marked change in semen it may be possible that .27 of a pH value is enough to affect the life of the sperm cells.

"It appears that a hydrogen ion concentration of about pH 7.5 indicates a critical condition of the equilibrum of the electrolytes present in horse semen.

A preliminary chemical analyses of portions of the above semen, normal and abnormal, were made by Dr. A. M. Peter, Head of the Chemistry Department, Kentucky Experiment Station, with the following results:

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*Correction for CO_2-free water (.125 pH) deducted.

Table 3. Chemical Analyses of Semen

Per cent by weight	Normal	Abnormal
Total solids, dried at 105°C.	2.38	3.49
Ash	0.78	0.60
Total nitrogen (N)	0.241	0.366
Total phosphorus (P)	1.017	0.028
Per cent ash in total solids	32.8	17.2
Per cent phosphorus in total solids	0.7	0.8
Per cent nitrogen in total solids	9.9	9.5

The proportion of total solids is distinctly larger in the abnormal semen than in the normal; the proportion of ash in the total solids of the abnormal semen, however, is markedly less than in the normal. The proportions of nitrogen and phosphorus in the total solids are sensibly the same in both. More analyses will be necessary to determine whether these differences are significant.

LIFE OF THE SPERMATOZOA IN THE WOMB.

Perhaps, no phase of breeding is as little understood as the time elapsing from breeding mammals to the time when actual fertilization takes place. If, for example, the egg of the female is not liberated for 24, 48 or 72 hours after insemination, will the spermatozoa remain motile and be capable of fusing with it?

It is the common opinion of breeders that the sperm live many days in the womb and tubes of the female. It is reported that live spermatozoa have been found in the organs of females twelve or fourteen days after mating, but the writer does not believe that their life extends beyond 48 hours.

Lewis[4] reports that out of 25 sows bred and destroyed in order to discover the length of time live sperm could be found in the womb and tubes: "In only three sows in the experiments of 1908-1910 could live sperm cells be found at a greater length of time than twenty hours after breeding. In two cases live cells were found after a lapse of more than forty hours, and in one case after a lapse of twenty-two and one-half hours."

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[4] 1911, The Vitality of Reproductive Cells. L. L. Lewis—Bulletin No. 96, Oklahoma Experiment Station.

EXPERIMENTS WITH HENS.

In 1919, with the assistance of J. H. Martin, of this station, a number of hens were isolated for a period of 24 days. The hens were hand mated with a vigorous cock and destroyed after periods verying from six hours as a minimum up to forty-eight as a maximum.

All the hens destroyed at the end of the six and eight hour periods showed live sperm. None of the spermatozoa had progressed farther than one-third the length of the oviduct. We were unable to find any sperm cells, dead or alive, after a lapse of fifteen hours.

EXPERIMENTS WITH MARES.

During the breeding season of 1921, four mares* were secured for experiment.

No. 1. May 25—Mated twice to a vigorous young stallion. Last service at 5 P. M. Two capsules of semen were caught and inserted into the womb.

May 26. Mare destroyed 16 hours after mating. The organs were scraped and slides prepared of the scrapings for the microscope. No sperm cells were found from scrapings of the womb or horns. One spermatozoon was found in the right tube but it had lost its power of movement. Womb and horns appeared to be normal.

No. 2. June 10—Mare was mated at 9 A. M.
Mare was destroyed at 2 P. M.

Inactive spermatozoa were found in the womb and horns. No motile sperm were observed. The womb and horns were inflamed and the mucous lining was very greatly congested.

No. 3. June 20—Mare was mated at 9:45 A. M.

At 3 P. M. mare was destroyed.

At 3:30 P. M. examination was made by scraping the mucus, with the following results.

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* These mares were donated to the Kentucky Agricultural Experiment Station by the Patchen Wilkes Stock Farm.

Inactive sperm found at vulva
Inactive sperm found in vagina.
Active sperm found at os.
Active sperm found in womb close to os.
Active sperm found in center of womb.
Active sperm found in womb at horns.
Active sperm found in right horn.
Active sperm found in center of right horn.
Active sperm found at entrance to right tube.
Active sperm found in left horn.
Active sperm found at entrance of left tube.

At 5 P. M. the sperm cells were vigorous in all parts of the organs examined.

No. 4. Mare No. 4 has an overgrown os and could not be used to test the length of life of the sperm. She is reserved for other work.

It appears that the womb and secretions of only one mare, No. 3, were friendly to the life of the sperm cells. The mare was bred at 9:45 A. M. and at 5 P. M., or 7¼ hours after mating, the cells were still moving with considerable vigor.

This fact becomes interesting when it is remembered that six hours is the average life of the sex cells when kept in the most favorable laboratory condition. It would seem that the fluids of the genitalia when normal have a tendency to prolong the life of the cells. From our work and that of Lewis, already referred to, it seems reasonable to assume that fertilization in mammals takes place in the vast majority of cases within twelve hours after insemination. Rare cases may extend the time to thirty-six or forty-eight hours. The spermatozoa after the first twelve hours of life on the mucus membrane of the womb and tubes are liable to become entangled on the surface and to be absorbed.

It would be of very great value to the horse breeder could the limits of fertilization after insemination be known, because mares have an extended heat period of from three to nine days.

Lewis[5] reports that the average time for sows to ovulate is thirty hours after the beginning of the heat period. If a mare is bred at the beginning of her heat period and does not ovulate until six or eight days later there will be slight or no chance for her to become pregnant. If the spermatozoa lived in the womb indefinitely there would be no concern as to the time she shed her ovum as compared to the time of insemination.

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[5] Lewis, L. L., loc cit.

Summary

1. Spermatozoa of mammals show activity under laboratory conditions for about 6 or 8 hours.
2. Spermatozoa are not especially sensitive to change of temperature and are not immediately injured by sunlight.
3. Spermatozoa are easily injured by acids and alcohols but are not so easily injured by alkalies.
4. Spermatozoa show activity longer in the uterus than under laboratory conditions.
5. The hydrogen ion concentration of the semen appears to have an influence on the activity of the spermatozoa.

FIG.1

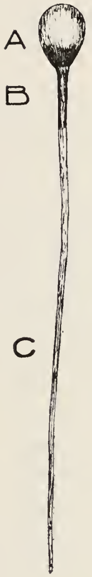


FIG.2

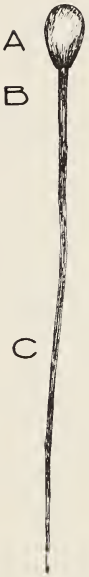


FIG.3

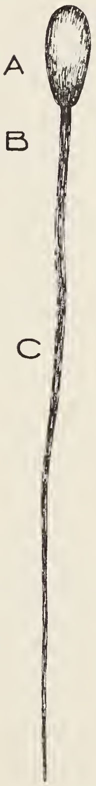
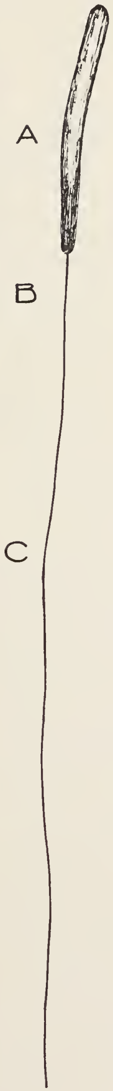


FIG.4



EXPLANATION OF FIGURES.

Figure 1. Spermatozoon of the human.
Figure 2. Spermatozoon of the horse.
Figure 3. Spermatozoon of the bull.
Figure 4. Spermatozoon of the rooster.

A, head. B, connecting piece. C, tail. Under a magnification of three thousand diameters no distinct connecting piece can be seen in the tail of the spermatozoon of the rooster.

The stains were made by Miss A. Harms and the measurements and drawings by Miss Virginia Anderson.

II. The Vitality of the Spermatozoa of Some Sea Animals.

INTRODUCTION

The purpose of this paper is to give the results of work done at the Carnegie Institute for Experimental Evolution, Cold Spring Harbor, New York, during July and August, 1916. The Director of the Station, Dr. C. B. Davenport, kindly placed at my disposal every facility of the institution for the collection of material and for carrying on the experiments. He also gave valuable advice as the work progressed.

The object of the investigation was to determine the vitality of the spermatozoa of some marine animals for the purpose of comparing the results with work already done with the sperm of mammals. After collecting the various animals which could be procured near Cold Spring Harbor and in Long Island Sound it was decided to use the oyster (Ostrea virginica) and the Hard Shelled Clam (Venus mercenaria).

BREEDING HABITS OF OSTREA VIRGINICA.

The breeding season of the oyster to be found on the Atlantic coast extends from early in the spring up to September. The temperature of the water has considerable effect on the time. Those found in the warmer waters of Maryland, Virginia and Carolina begin to spawn before those of Long Island and the New England coast.

It is not known just how long the breeding season will last for any single bed of oysters, but the period extends over several weeks. During July the specimens procured in the waters of Long Island, were all in the process of extruding their eggs and sperm. The process continued into August. Not until August 6 was an oyster found which had completely finished the spawning process, and only a very few sterile ones were found up to the 15th of August, when the work ceased. By the middle of

August it was evident that the process of spawning was well advanced and would be completed in a few days.

SEXES.

There are in European waters oysters which possess both ovaries and testicles and are truly hermaphroditic. The sperms fertilize the eggs in the mantle chamber of the mother where the development takes place until the young oyster can begin its free swimming career.

The Atlantic coast oysters (Ostrea virginica) on the American side are male and female. There is no way by examining the shell to distinguish the sexes. When opened the appearance of the two sexes is identical. The only way to distinguish the male from the female is by examining the products of the gonads under the microscope. The gonads of the female produce eggs only, while sperm alone is found in the sex glands of the male.

GERM CELLS.

The eggs are small, pear-shaped bodies, containing a rather large germinative vesicle. The eggs when mature are extruded into the water as the oyster lies on the bottom. The process is a gradual one going on from day to day for perhaps as long as six or eight weeks. The quantity of eggs which an adult female can shed in any one breeding season runs up into the millions, perhaps going as high as seventy-five million. The well-developed female will begin to mature eggs by or before the time she is one year old, and the process continues each season of her life, the length of which is several years under natural conditions.

The male oyster sheds his milt, or seminal fluid, into the water as it is swept thru his mantle cavity in the same way as the eggs of the female are shed. There is no concerted effort, or sexual excitement, on the part of the sexes, to exude eggs and milt at the same time and place as we find in fish. The eggs leave the female, to be washed about by the currents of the water which receives them, and in a few hours perish unless the water is also bearing active sperm. The meeting of the eggs and sperm is an accidental occurrence. As a mater of fact, but a small percentage of the eggs are ever fertilized, and few of those fertilized ever reach the sessile period of their development.

There is no way to estimate the number of spermatozoa which the average male oyster exudes during the breeding season, but the number will go well up into the billions. The sperm is in form of the usual type, consisting of a head, middle piece and tail. Fig. 1.

FERTILIZATION AND DEVELOPMENT.

By placing eggs and sperm together on a drop slide I was able to watch some of the early developing stages. Sperm would become attached to the eggs in a few seconds or, at most, minutes after bringing them in contact in the same fluid. Almost immediately, the eggs begin to change. The egg loses its pear shape and becomes spherical, while the germinative vesicle disappears and the polar body is extruded. In from two to three hours after fertilization the embryo has reached the 16-cell stage and from this on development is very rapid, so that in four or five hours the cilia thrown out enable the little animal to swim at will. This it continues to do for from 5 to 10 days, by which time the shell makes its appearance and it sinks to the bottom and attaches itself to the most convenient object to be found; should it find none and sink into the mud or sea ooze, it soon perishes.

MOTILITY OF THE SPERMATOZOA.

There is little, if any, activity of the oyster sperm in the gonads of the male. There is a slight movement in the milt, or semen, secured at the organ of extrusion, but the semen is so viscid that but little movement is found. The instant the seminal fluid is diluted with sea water the very greatest activity begins. Nature has fashioned the spermatozoon of the oyster to live and display its activity in sea waters. In sea waters fertilization takes place.

EFFECT OF CHEMICAL SOLUTIONS.

When a drop of seminal fluid is placed on a microscope-slide and examined the sperm are seen to be immotile. Motility begins the moment the semen is diluted with sea water. A smear of the semen can be made, and by placing a drop of sea water in contact with one edge of it on the slide, the activating influence of the water can be watched as it gradually diffuses over the sperm. Fresh water and distilled water do not have any activating effect on the sperm.

The purpose in the following experiments was to determine which of the salts contained in normal sea water, is the cause of movement in the sperm. Sea water contains .35% $MgCl_2$, .17% $MgSO^4$, .14% KCl, and 2.61% NaCl. Solutions were used in distilled water representing the concentration of each salt as it is found in sea water.

Oyster sperm in distilled water. No activity.
Oyster sperm in fresh water. No activity.
Oyster sperm in .35% $MgCl_2$ distilled water. No activity.
Oyster sperm in .17% $MgSO_4$ distilled water. No activity.
Oyster sperm in .14% KCl distilled water. No activity.
Oyster sperm in 2.61% NaCl distilled water. Normal activity.

It is the NaCl which causes the dormant sperm to begin the movement necessary to enable the sperm to find the egg in sea water and fuse with it. This, of course, is what would be expected under the circumstances because the NaCl is found in sea water in much greater quantity than any of the other chemical compounds.

Various combinations of $MgCl_2$, $MgSO_4$, and KCl, were tried but no concentration of the three or of any two of them had the slightest effect on the sperm.

The tabulation below is the result of a series of observations to determine the minimum and the maximum concentration of NaCl in which the sperm will exhibit movements.

Oyster sperm in .50% NaCl. No activity.
Oyster sperm in .91% NaCl. Slight activity.
Oyster sperm in 1.35% NaCl. Greater activity.
Oyster sperm in 1.80% NaCl. Less than normal activity.
Oyster sperm in 2.00% NaCl. Appears to be normal activity.

Oyster sperm in 2.25% NaCl. Appears to be normal activity.
Oyster sperm in 2.61% NaCl. Normal activity.
Oyster sperm in 3.00% NaCl. Normal activity.
Oyster sperm in 3.50% NaCl. Close to normal activity.
Oyster sperm in 4.00% NaCl. Less than normal activity.
Oyster sperm in 4.50% NaCl. Slight activity.
Oyster sperm in 5.00% NaCl. Slight tremor just for an instant.
Oyster sperm in 6.00% NaCl. No activity.
Oyster sperm in 10.00% NaCl. No activity.

From the above tabulation it will be seen that the concentration of the sea water may vary over a wide range and yet not destroy the sperm. The amount of NaCl may vary from 1.80% or 2% to 3% or 3.50%, which is a much larger range than is found on the coast of the Atlantic, and it explains the reason why oysters can breed in rivers some distance back from the great body of salt water.

LENGTH OF ACTIVITY.

Spermatozoa placed in filtered sea water retained their vigor of movement from 8 A. M. to 3 P. M. After 7 hours the speed of their movements diminished rapidly. In no case was any active sperm found 24 hours after placing the seminal fluid in sea water. It is the opinion of the writer that when the sperm is shed into the medium about the oyster, fertilization takes place in a few minutes, if at all, or at most takes place in an hour or two. Should the sperm in this short time not find the egg, it perhaps looses its vigor so that it is not able to enter the egg when found.

To determine if sunlight has any bad effect on the sperm, seminal fliud in filtered sea water was, on different days, exposed to the direct rays of the sun. It could not be seen that the direct rays of the sun had any effect whatever. This is what would be expected when it is remembered that at low tide some oyster beds are not more than from 12 to 36 inches under the surface of the water and the direct rays of the sun can reach them.

THE EFFECT OF ALKALIES ON SPERMATOZOA.

When 1 cc of N/10, NaOH or KOH was added to 1 cc of sea water containing normal spermatozoa there was little decrease in the vigor of movement; 2 cc of either solution added to 1 cc of sea water diminishes the activity of the sperm to a much greater degree. The greater concentrations of alkalies do not seem harmful except as they reduce the concentration of NaCl in the sea water, rendering it too dilute to activate fully the sperm.

To determine the quantity of Na_2CO_3 necessary to injure the sperm, solutions were made by dissolving known weights of Na_2CO_3 in known weights of sea water.

Oyster spermatozoa treated with 1. % solution of Na_2CO_3 normal activity.

Oyster spermatozoa treated with 2. % solution of Na_2CO_3 normal activity.

Oyster spermatozoa treated with 3% solution of Na_2CO_3 normal activity.

Oyster spermatozoa treated with 3.5% solution of Na_2CO_3 normal activity.

Oyster spermatozoa treated with 4. % solution of Na_2CO_3 less than normal activity.

Oyster spermatozoa treated with 4.5% solution of Na_2CO_3 less than normal activity.

Oyster spermatozoa treated with 5. % solution of Na_2CO_3 much less than normal activity.

Oyster spermatozoa treated with 7. % solution of Na_2CO_3 no activity.

Oyster spermatozoa treated with 10. % solution of Na_2CO_3 no activity.

Not until 4% Na_2CO_3 in sea water is reached can there be a detection of the effect. In a 5% concentration there is a degree of activity not very different from the normal. Above this concentration the effect is appreciable until a 7% concentration results in no activity.

ALCOHOL.

The action of alcohol on the oyster spermatozoa gave unexpected results. The writer had found, as has been reported in detail in part I of this bulletin that 1% solution of C_2H_5OH will injure the sperm of mammals.

In working with oyster sperm it was necessary to make the solution in filtered sea water, or in distilled water containing 2.61% NaCl.

Solutions of sea water and alcohol gave the following results:

Oyster spermatozoa treated with .5% solution C_2H_5OH normal activity.

Oyster spermatozoa treated with 1. % solution C_2H_5OH normal activity.

Oyster spermatozoa treated with 1. % solution C_2H_5OH normal activity.

Oyster spermatozoa treated with 2. % solution C_2H_5OH normal activity.

Oyster spermatozoa treated with 5. % solution C_2H_5OH normal activity.

Oyster spermatozoa treated with 7.5% solution C_2H_5OH normal activity.

Oyster spermatozoa treated with 10. % solution C_5H_2OH normal activity.

Oyster spermatozoa treated with 15. % solution C_2H_5OH some activity.

Oyster spermatozoa treated with 17. % solution C_2H_5OH slight activity.

Oyster spermatozoa treated with 20. % solution C_2H_5OH no activity.

The effect of alcohol in the more concentrated solutions was to stimulate the sperm cells to greater activity and then to hasten their death. While no observable effect upon them could be seen from the less concentrated solutions fertilization was never observed with any percentage of alcohol present. The presence of a small amount, too little to be detected by the behavior of the germ cells themselves, always interfered with the fertilization or segmentation of the eggs. One can only judge of fertilization by the process of the development of the eggs in solution with the spermatozoa.

EFFECT OF ACID.

To determine the effect of acid on the sperm active in filtered sea water, a known percentage of the acid was added and the results noted as follows:

Oyster spermatozoa treated with .36% solution of HCl no activity.

Oyster spermatozoa treated with .18% solution of HCl no activity.

Oyster spermatozoa treated with .009% solution of HCl no activity.

Oyster spermatozoa treated with .045% solution of HCl no activity.

Oyster spermatozoa treated with .0225% solution of HCl slight activity.

Oyster spermatozoa treated with .01125% solution of HCl more activity.

Oyster spermatozoa treated with .00565% solution of HCl normal activity.

It is apparent from the above tabulation that an almost imperceptible amount of acid is injurious to the sperm of the oyster.

It will be noted that oyster spermatozoa, which have sea water as their natural medium, are as susceptible to the influence of acids as the spermatozoa of mammals. To save space the tabulation of the results with HCl only are given. The acids HNO_3, H_2SO_4 and $HC_2H_3O_2$ were tried with results similar to those given for HCl. A .045% solution of any of the acids made active cells inactive.

VENUS MERCENARIA.

To make a record of the peculiar character of the spermatozoa of the hard shell clam (Venus mercenaria) the following observations are given:

The breeding habits of the hard shell clam (Venus mercenaria) are identical with those of the oyster. The eggs are pear shaped like those of the oyster and the star fish.

The morphology of the sperm is the greatest point of difference. There is no resemblance of the spermatozoa of the Venus mercenaria to those of the Ostrea virginica or to any sperm of mammal, fish or insect examined by the writer. The spermatozoon of the hard shell clam under a magnification of 215 diameters has the appearance of a horn with the tip sawed off. There is no evidence of a tail. When examined under a power of 430 diameters the head gave the same appearance as with the lower power and occasionally the lashing of the flagellum could be seen.

Stains were made with Wright's blood stain, Janus blue and other stains and then examination made with the oil immersion objective. By this means the exact forms of the head and tail were revealed. Fig. 3.

The head is the shape of a horn with the tip of the horn blunt. The tail is attached to the center of the large end of the head and is very fine and long, much longer than the flagellum of any other sperm examined. It is unusual because of its extreme fineness. Under the high power used, after staining, it is hair like in its appearance.

The "head" end of the sperm is blunt, the cylindrical part is curved like a horn, while the larger end of the head is about twice the diameter of the smaller end. The sperm moves in a circular manner always keeping the concave part of the sperm head on the inside of the circle. Dilute solutions of the seminal liquid were prepared for the purpose of studying the movement, and the circular form represents the normal activity. The flagellum appears never to be curved in opposition to the curvature of the head but always with it. No sperm were observed in which the convexity of the tail did not correspond to the convexity of the head, giving the whole sperm, head and tail, the appearance of one continuous curve.

The lashing of the tail carries the head in a spiral or circular direction. The rate of movement is less than the movements of sperms which have shorter tails.

It requires sea water to give movement to the spermatozoa of clams and their behavior in the presence of various chemicals is similar to the behavior of the sperm of oysters. Perhaps alcohol has a slightly greater influence on them than on the spermatozoa of the oyster, while the sperm of the clam can stand a somewhat greater degree of acidity than the oyster spermatozoa.

The spermatozoa of the clam very soon become attached to the eggs when brought in contact in a drop slide. The act of penetration was not observed.

NASSA OBSOLETA.

For the sake of comparison the spermatozoa of the mud snail (Nassa obsoleta) were examined. This snail lives in sea water as a normal medium, but at low tide can live as the oyster and clam, out of it for a time. It differs in its breeding habits, as copulation takes place and the semen of the male is by means of an intromittent organ, placed within the body of the female where the eggs are fertilized. They are, after fertilization, deposited by the female on grass or other convenient objects.

The process of copulation prevents the sperm from coming into contact with the sea water, and their life history is different from those sperm that do live in the sea. In form the spermatozoon of Nassa obsoleta is not greatly different from the standard mammalian kinds. It is composed of a flat head, middle piece and tail. The tail is longer than that of the oyster spermatozoon; otherwise there is no apparent difference. Fig. 2.

The spermatozoa of the mud snail are injured by small amounts of acids and alcohols, like the spermatozoa of mammals. They are not motile in sea water for the reason, evidently, that copulation takes place and the seminal fluid does not come in contact with the salt water of the sea. Unlike the oyster and clam sperm they are very active in the semen in which they are ejected by the male.

SUMMARY.

1. The spermatozoa of Ostrea vinginica and Venus mercenaria are immotile in the sex glands and the seminal fluid.
2. Fresh or distilled water has no influence on them.
3. The NaCl in sea water causes them to become active and

normal activity is manifested in solutions of NaCl varying from 2 to 3.5%.

4. The dilute solutions of alkalies are not apparently injurious to the spermatozoa.

5. The spermatozoa live and exhibit very great activity in 10 and even 15% solutions of alcohol.

6. Very dilute solutions of acid are injurious to the spermatozoa.

7. The spermatozoa of Nassa obsoleta resemble the spermatozoa of mammals rather than the spermatozoa of the oyster and clam.

FIG. 1

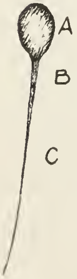


FIG. 2

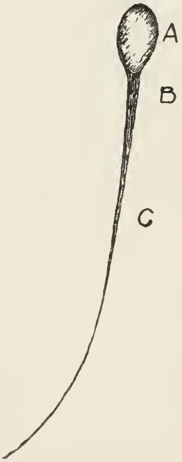
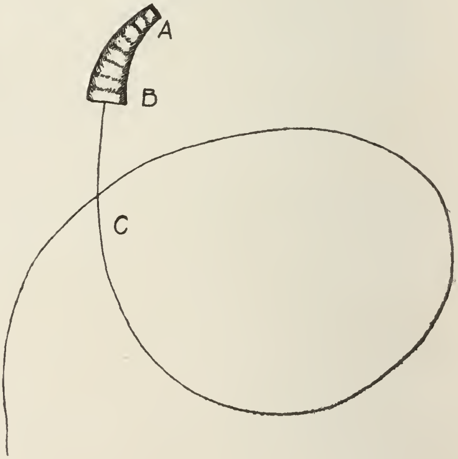


FIG. 3



EXPLANATION OF FIGURES.

Fig. 1. Diagrammatic representation of spermatozoon of **Ostrea** virginica. A, head. B, middle piece. C, tail.

Fig. 2. Spermatozoon of Nassa obsoleta. A, Head. **B. middle** piece. C, tail.

Fig. 3. Spermatozoon of Venus mercenaria. A and B, **the horn**-like head. C, the very long tail curved to correspond with **the curve** of the head.

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LAND PRICES AND LAND SPECULATION IN THE BLUEGRASS REGION OF KENTUCKY.

BULLETIN NO. 240.

(Research Bulletin)

Lexington, Ky.

January, 1922

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BULLETIN NO. 240

(Research Bulletin)

Land Prices and Land Speculation in the Bluegrass Region of Kentucky.

By G. W. FORSTER*

THE PURPOSE

In recent years public attention has been directed toward the question of land values and land prices.[1] The focusing of attention on this question has been due, in part, to the rapid increase in land prices which has taken place during the last 20 years and, in part, to the recent speculative buying and selling which has occurred in many parts of the country. When it is considered how closely related the question of land values is to the many and difficult agricultural problems, such as tenancy, absentee landlordism, agricultural taxation, agricultural credit, cost of production and intensity of culture, it seems natural enough that the public should be interested. The relationship of land values to important social and economic problems bearing primarily upon agriculture, but at the same time affecting the whole body politic, furnishes at once the need and the justification of careful studies in this field.

This investigation, however, was not undertaken for the purpose of showing the relationship of land values to agricultural problems in general. Its scope is restricted to the study of the economic and social forces and conditions which tend to influence the prices paid for farm land in a specific region at a time of active speculation, and to consider the probable effect of the rapid increase in land prices on agricultural production and on the economic and social status of the farming classes.[2]

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*Resigned to become Assistant Chief of the Office of Farm Management and Farm Economics, U. S. Department of Agriculture.

[1] In this bulletin the term "land prices" is used when the change in the price of land is one accompanying movements of the general price level. The term "land values" means changes in the value of land in relation to other commondities. It is conceivable that land prices might be increasing while land values as expressed in purchasing power might be falling. This distinction between land prices and land values is made for the purpose of exposition.

DESCRIPTION OF THE AREA

The area to which this investigation applies is what is known as the Bluegrass Region of Kentucky. The part of the area studied includes the counties of Bourbon, Clark, Fayette, Jessamine, Madison, Scott and Woodford. These counties, the heart of the Bluegrass Region, constitute a very productive agricultural area with soil and climate especially favorable to agriculture. (See Figure 1)

The leading crops of the area are corn, oats, wheat, rye and tobacco. The two cereals, rye and barley, which were formerly of considerable importance in this region, have declined greatly since 1840. The oat crop was of much more importance in 1860 than it is today. At one time hemp was an important crop, but the introduction of white Burley tobacco, which proved to be more profitable, has greatly reduced the production of hemp. The relative importance of these crops is shown in Table 1.

White Burley tobacco is the most important money crop of the region. This crop has shown a most remarkable increase since 1880, both as to value and acreage. The reason for this popularity is its profitableness, because of the fact that the soil and climate are especially adapted to its production, and because it is a crop which furnishes fairly steady employment thruout the year.[3]

Owing to the excellent pastures, live-stock enterprises have always occupied an important place in the farming of this region. Beef cattle, tho not produced in as large numbers as formerly, are still of importance. Dairy cattle have shown a slight increase. The swine industry formerly was much more important than it is today, but during recent years this industry has shown a tendency to revive, more attention being given to the production of purebred stock. Sheep have continued fairly constant in number.

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[2] Acknowledgment is due to Dr. L. C. Gray, Chief of the Division of Land Economics, Office of Farm Management and Farm Economics, U. S. Dept. of Agriculture, for valuable assistance in the preparation of the material presented in this bulletin.

Credit is due to Jesse W. Tapp, Junior Agricultural Economist, Office of Farm Management and Farm Economics, U. S. Dept. of Agriculure, who aided in gathering and tabulating the data.

[3] See United States Department of Agriculture Bulletin No. 482.

The transportation facilities of the region are well developt. Lexington, the largest city in the area, is served by three railway systems, which connect the region with the large western markets and with the Atlantic and Gulf ports. The city of Lexington is connected with the county seats of Scott, Bourbon, Jessamine and Woodford by both railway and electric trolley lines, and by rail with the county seats of Madison and Clark. (See Figure 1)

FIG. 1

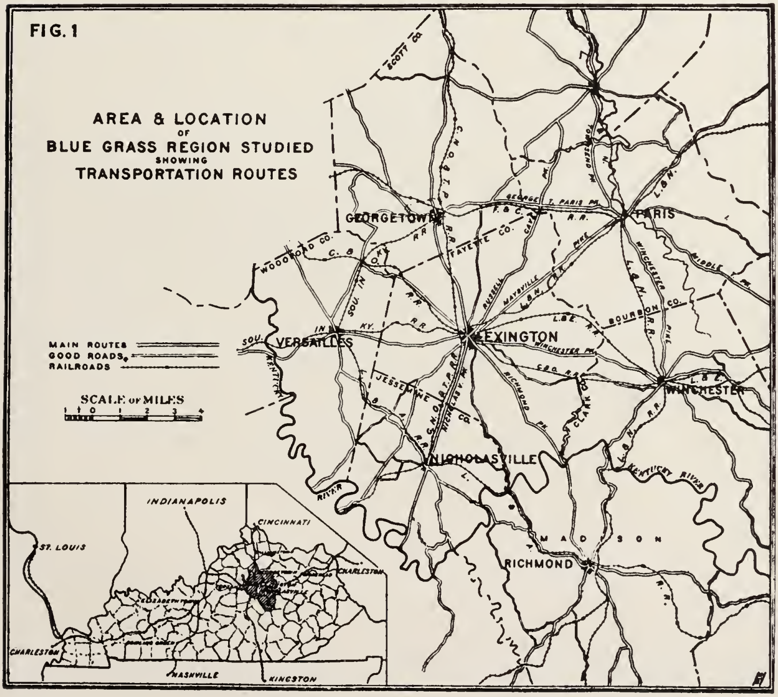

Table I.—Production of the principal crops and number of the principal classes of live stock for the counties of Clark, Fayette, Woodford, Madison, Scott, Jessamine and Bourbon, from 1850 to 1920 (U. S. Census).

Year	Crops (000 omitted)								Live Stock (000 omitted)			
	Corn, Bu.	Oats, Bu.	Wheat, Bu.	Rye, Bu.	Potatoes, Bu.	Hay, Tons	Tobacco, Lbs.	Hemp, Lbs.	Dairy Cows, No.	Other Cattle, No.	Sheep, No.	Swine, No.
1850	1222	143	49	14	24	2	27	3013	4	10	20	36
1860	1126	155	176	26	26	3	23	1665	4	10	13	28
1870	828	90	67	40	23	3	10	1510	3	10	8	18
1880	892	42	264	16	23	3	33	1121	3	10	24	19
1890	974	89	246	11	49	10	3006	2289	4	10	19	19
1900	766	29	303	6	18	10	4972	1145	4	11	16	15
1910	1008	23	194	6	55	10	6707	530	4	9	18	11
1920	878	18	209	6	165	26	8434	28	4	9	16	17

METHOD OF INVESTIGATION

The basic material for his bulletin was procured by questioning buyers and sellers of farm land and recording their answers on a uniform schedule. This schedule covered location of farm; names of purchaser and seller, and the occupation, residence and agricultural experience of each; the price per acre; the estimated value of improvements; the terms of sale; and the individual or institution furnishing the credit necessary to the purchase. Special effort was made to learn in each case the reason for the sale or purchase of the land. In all, 1,146 records of land transfers were obtained, 1,086 of which were sufficiently complete to supply the larger portion of the data used in this bulletin.[4]

Information of a general nature concerning economic conditions and the activity relative to buying and selling of farm land was obtained by personal interviews with farmers, real estate men, retired farmers, and others actually in touch with the situation.

Data on net rents from farm lands were obtained from 150 landlords who rent their farms on a cash, share, or share-cash basis. Additional data concerning farm income were obtained by survey of 52 farms. Farm management data on the cost of, and income from, tobacco were procured from the studies conducted on 81 farms in this region. (Kentucky Bulletin 229.) Additional data relating to the region were taken from the United States Census.

THE TREND OF LAND PRICES[5]

There was a time when free agricultural land of a good quality was very abundant in this country. Indeed, so vast was the area of our public lands that the supply seemed practically inexhaustible; nevertheless, the settlement of our public domain was so rapid that by 1890 good free lands in the humid regions of the United States had been practically all taken up. Soon after the passing of most of our public domain into private hands and more than keeping pace with the increase in our population, farm lands showed a strong tendency to increase in price. From 1850 to 1890 the average price of farm lands increased from $11.14 to $21.31 per acre, or an increase of 91 per cent. However, the too rapid settlement of our public lands and consequent overproduction of agricultural products, with a general downward movement of prices of commodities, resulted in the agricultural depression of the early nineties. Consequently, land prices did not increase during the decade from 1890 to 1900; in fact, they receded slightly.[6] From 1900 to the present time, however, there has been a phenomenal increase in prices of farm land. For the United States as a whole, the increase has been 257 per cent, while in some states, notably Iowa, the increase has been as great as 407.6 per cent.

The commodity price index numbers shown in Fig. 2 were computed from the Bureau of Labor Statistics, Juergen's Index Series, and Hansen's Index Series. These three series of index numbers were converted into a continuous series from 1801 to 1920, base 1913 = 100.

Logarithmic scale has been used in all the charts in this bulletin in order to show the proper relationship between the curves. When two or more curves are plotted on a logarithmic

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[5] Farm land with improvements.
[6] See Figure 2.

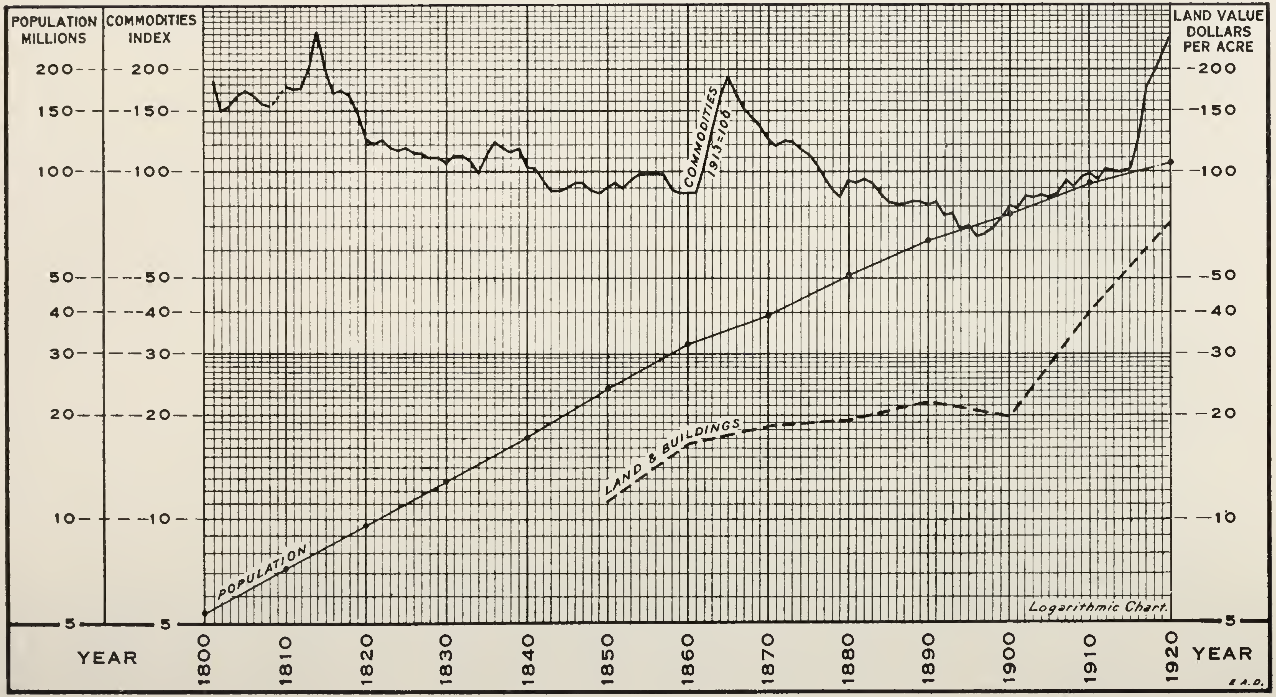

FIG. 2. TREND OF COMMODITY PRICES, LAND VALUES AND POPULATION, UNITED STATES, 1800-1920.

scale they may be compared directly with each other. For example, if two curves move together, it means that the percentage increase or decrease of one is equal to the percentage increase or decrease of the other, irrespective of their position on the chart.

TREND OF LAND PRICES IN KENTUCKY

The rise of land prices in Kentucky has been somewhat similar to, altho not quite as marked as, the general rise for the United States as a whole. From 1850 to 1890 the average price of farm land in Kentucky increased from $9.15 to $16.17 per acre, or an increase of 76 per cent. During the years from 1860 to 1900, land in the state showed a slight tendency to increase in price, the percentage increase for this period being 14.2 per cent.

From 1900 to 1920 the increase in common with other parts of the country has been phenomenal. For this period the increase per acre has been $43.01, or 247 per cent. (Table II).

Table II.—Average price per acre of farm land with improvements, for seven counties in Central Kentucky, from 1880 to 1920.[1]

COUNTY	1880	1890	1900	1910	1920
Bourbon	$58.61	$65.06	$72.39	$104.36	$270.31
Clark	31.61	47.90	50.83	83.58	171.55
Fayette	76.16	88.59	84.88	137.55	314.12
Jessamine	46.05	50.55	50.59	85.38	208.37
Madison	25.37	29.21	29.40	51.38	113.61
Scott	36.96	44.12	45.60	68.60	160.70
Woodford	47.87	59.82	59.08	95.16	217.28
Average	$41.67	$53.26	$54.41	$89.44	$200.25
Increase over preceding period	$16.24	$11.59	$1.15	$35.03	$110.81
Index. (Average price 1880)	100.00	128.00	130.00	214.00	481.00
Average for Kentucky	$13.92	$16.17	$17.38	$28.64	$60.39
Increase over preceding period	$2.76	$2.25	$1.21	$11.26	$31.75
Index. (Average price 1880)	100.00	116.00	125.00	206.00	434.00

[1] Census data.

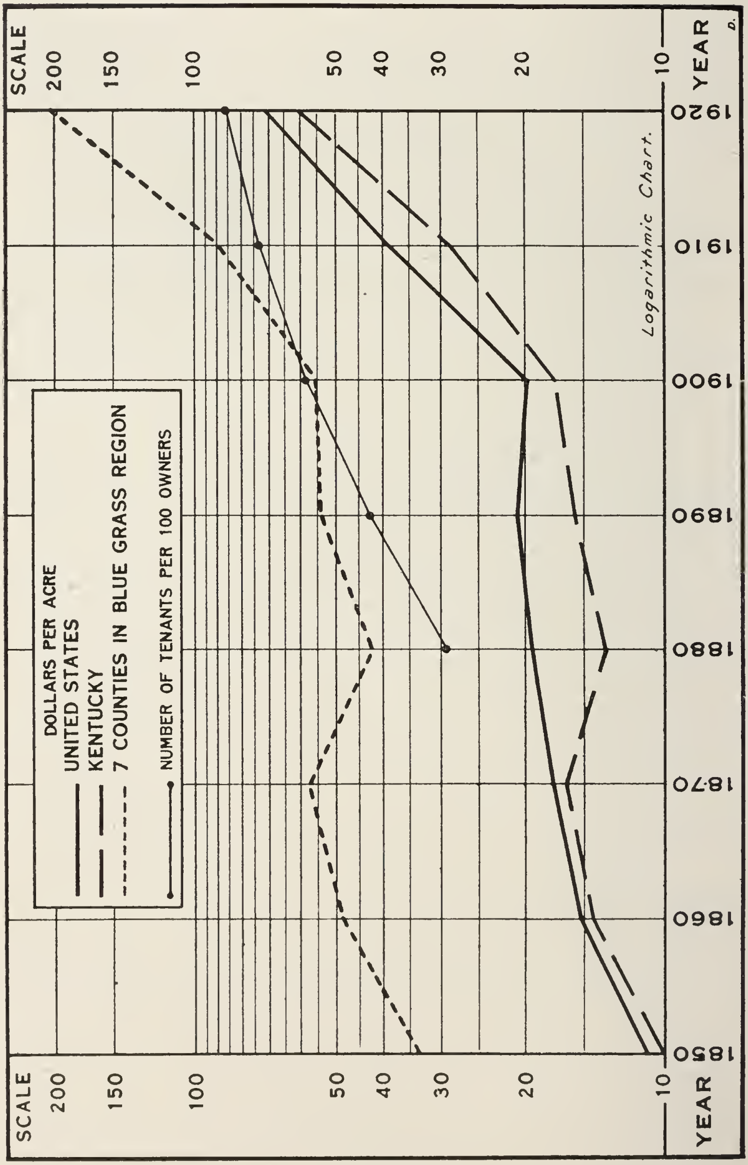

FIG. 3. TREND OF LAND PRICES, 1850-1920.

The relation of land prices in Fayette and the six contiguous counties covered by this investigation to the land prices of the state and to the nation is shown in Figure 3. From 1850 to 1890 land prices in this region increased from $34.09 per acre to $53.26 per acre. From 1890 to 1900 there was hardly any advance in the price of farm lands. During the last 20 years land prices have increased rapidly, reaching $200.25 per acre in 1920.

EVIDENCE OF ACTIVITY IN BUYING AND SELLING FARM LAND

As in many other sections of the United States, there occurred in the counties of Central Kentucky a period of extreme activity in the buying and selling of farm land. This activity was occasioned by the rapid rise in price of agricultural commodities generally, but more especially of White Burley tobacco. Under such conditions, given a rich agricultural region capable of producing a crop returning large profits, land prices naturally would be expected to advance. The data presented in table III show that sales increased 40 per cent between 1918 and 1920. Farm sales recorded in 1920 constitute 19.7 per cent of the total farms in the region. These data do not include resales or intermediate sales. When this is considered, it is evident the activity was far from being a superficial phenomenon.

Additional evidence could be marshalled if a complete study were made of the increase in the number of farms advertised for sale by the leading daily papers of the region. In normal times farm sale advertisements are not numerous. For one week in July, 1913, one of the leading daily papers did not carry a single line of advertisement involving farms above three and one-half acres. For the corresponding week in 1919, the same paper carried 77 inches of farm "ads" (at the rate of 14 lines to the inch) besides a page display advertisement of an auction sale of farm land.

Table III.—Number of farm sales recorded in the office of the county clerk for seven counties in Central Kentucy from 1918-1920.

COUNTY	Number of farms.			Per Cent Increase Over 1918
	1918[1]	1919[2]	1920[3]	
Bourbon	243	257	306	26
Clark	258	285	458	77
Fayette	312	440	525	68
Jessamine	196	149	200	2
Madison	461	378	545	18
Scott	337	383	402	19
Woodford	179	326	353	97
Total	1986	2218	2789	40

[1] September 1, 1917, to September 1, 1918.
[2] July 1, 1918, to July 1, 1919.
[3] July 1, 1919, to July 1, 1920.

PRICES PAID FOR LAND

In Table IV data are presented showing the prices received for 930 farms sold between January 1, 1917, and May 1, 1920. Land prices in these counties showed a marked increase for the years 1918, 1919 and 1920, as compared with 1917. For example, in 1918, prices showed an increase of $18.10 per acre over those of 1917; in 1919 there was an increase of $91.00 per acre; and for 1920, $118.10 per acre, over the prices of 1917. In this connection it is worth while to observe that but few farms sold for over $800.00 per acre, and out of 940 sales, only one farm sold for as much as $1,000 per acre. From reports in circulation at the time, the impression was likely to be gained that land was selling at much higher prices than these data indicate. It is believed, however, that the data presented are sufficiently extensive to give a correct impression of the condition in regard to the range in prices and the relative number of sales made at each price.

Table IV.—Average selling price per acre of farm land with improvements in 930 sales in seven counties of Central Kentucky.

COUNTY	1917		1918		1919		1920	
	No. of records.	Value per acre.	No. of records.	Value per acre.	No. of records.	Value per acre.	No. of records.	Value per acre.
Bourbon	15	$163.35	26	$180.90	44	$250.15	42	$332.28
Clark	1	112.42	7	178.19	40	267.14	52	272.45
Fayette	11	195.50	47	199.50	139	306.75	48	380.00
Jessamine	4	120.30	11	152.35	43	242.41	66	244.46
Madison	2	149.68	14	122.00	32	143.79	42	176.86
Scott	2	167.91	30	162.18	42	248.95	28	245.64
Woodford	3	164.92	17	192.50	47	222.09	75	251.08
Ave. value	38	$170.50	152	$188.60	387	$261.50	353	$288.60
Increase over preceding year				$18.10		$72.90		$27.10
Per cent of increase over 1917 prices				10.6		53.3		69.2

Table V.—Range in price per acre of farm land.

VALUE PER ACRE	1918		1919		1920	
	No. of farms.	Per cent of farms.	No. of farms.	Per cent of farms.	No. of farms.	Per cent of farms.
Under $100	18	12.0	18	4.8	15	4.2
$100—under $200	67	44.7	64	17.2	69	19.2
$200—under $300	46	30.7	135	36.2	101	28.2
$300—under $400	17	11.3	91	24.4	87	24.2
$400—under $500	2	1.3	36	9.7	53	14.8
$500—under $600			14	3.8	18	5.0
$600—under $700			9	2.4	10	2.8
$700—under $800			2	.5	3	.8
$800 and over			4	1.0	3	.8
Totals	150	100.0	373	100.	359	100.

THE BUYERS AND SELLERS OF FARM LAND

Frequently the statement is made that the buying and selling of farm land is done by professional traders or speculators, realtors, merchants, doctors, lawyers, teachers, or other non-farming, city-dwelling individuals, whose knowledge of farm land is necessarily limited and whose interests are not primarily associated with the business of farming. While there is an element of truth in such a statement, it is evident, if the data presented in Table VI be correct, that those most active in the buying and selling of farm land were not non-farmers, but farmers.[7]

Table VI.—Distribution of 940 farms bought and sold by farmers and non-farmers.

CLASS OF PURCHASERS	Farms Purchased		Purchasers		Farms Sold		Sellers	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Farmers[1]	791	84.1	725	87.7	748	79.6	556	84.6
Non-farmers	149	15.9	102	12.3	192	20.4	101	15.4
Totals	940	100.0	827	100.0	940	100.0	657	100.0

[1] Includes retired farmers.

While it seems true that non-farmers were active in buying and selling farm land, they did not, so far as direct sale or purchase was concerned, play such an important role as might be supposed. Their influence was exerted rather in an indirect way, as agents of the sales and purchases.

In this connection attention is called to the data presented in Table VII.[8]

It seems that the majority of those buying and selling farm land during the period under consideration were experienced landowners and in no sense can it be said that the buying and selling of farm land was principally done by a non-landowning class.

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[7] In a recent study of farm land values in Iowa (U. S. D. A. Bul. No. 874), it was found that farmers constitued 71.7 per cent of the buyers and 71.5 per cent of the sellers.

[8] To faciliate the presentation of the data, the buyers and sellers were divided into two groups, the grouping being based on their experience as landowners. For example, in Group 1 were placed all those who became landowners during the period studied, while in the second group were placed those individuals who became landowners prior to the active period.

Table VII.—Average age, average age at first attainment of ownership, and average number years of ownership, of 721 buyers and 512 sellers classified according to farmers and non-farmers.

CLASS	Group I. First experience as owners.[1]						Group II. More than one year as owners.[2]									
	Purchasers			Sellers			Purchasers					Sellers				
	Number	Per cent	Ave. age	Number	Per cent	Ave. age	Number	Per cent	Ave. age	Ave. No. of years ownership	Ave. age at beginning of ownership.	Number	Per cent	Ave. age	Ave. No. of years ownership	Ave. age at beginning of ownership.
Farmers	125	84.6	39.1	48	82.8	42.6	509	88.8	45.6	16.0	29.6	402	88.6	49.6	21.3	28.4
Non-farmers	23	15.4	37.	10	17.2	39.8	64	11.2	45.7	10.98	34.7	52	11.4	47.7	12.9	34.8
Totals	148	100.0	38.9	58	100.0	42.6	573	100.0	45.6	15.34	30.13	454	100.0	49.4	20.36	29.1

[1] Individuals becoming owners for the first time during period studied.
[2] Individuals who became owners prior to the period studied.

Table VIII.—Classification of 721 purchasers and 512 sellers according to whether they became owners thru tenancy or became owners directly.

The Road to Ownership.	Group I. First experinece as owners.[1]						Group II. More than one year as owners.[2]					
	Buyers			Sellers			Buyers			Sellers		
	Number	Per cent	Per cent of total purchasers.	Number	Per cent	Per cent of total sellers	Number	Per cent	Per cent of total purchasers.	Number	Per cent	Per cent of total sellers
Owners thru tenancy.												
1. Farmers	96	64.9	13.4	26	44.9	5.1	265	46.2	37.	167	36.8	32.4
2. Non-farmers	3	2.0	.4	1	1.7	.2	9	1.6	1.	6	1.3	1.2
Sub-total	99	66.9	13.8	27	46.6	5.3	274	47.8	38.	173	38.1	33.6
Owners direct.												
1. Farmers	29	19.6	4.1	22	37.9	4.3	244	42.6	33.7	235	51.8	46.
2. Non-farmers	20	13.5	2.8	9	15.5	1.8	55	9.6	7.6	46	10.1	9.
Sub-total	49	33.1	6.9	31	53.4	6.1	299	52.2	41.3	281	61.9	55.
Total	148	100.0	20.7	58	100.0	11.4	573	100.0	79.3	454	100.	88.6

[1] Individuals becoming owners for the first time during the period studied

[2] Individuals who became owners previous to the period studied.

It appears, also, that a considerable proportion of those active in buying and selling farm land had been tenants prior to becoming landowners. Thus, in Group 1, Table VIII, 66.9 per cent of the purchasers and 47 per cent of the sellers had been tenants prior to acquiring the ownership of farm land. In the case of those who had acquired farm land prior to the period studied, as illustrated in Group II, Table VIII, 47.8 per cent of the purchasers and 38.1 per cent of the sellers had been tenants before acquiring ownership. It is worthy of consideration that even some of the buyers and sellers classed as non-farmers were not without farm experience, as some individuals in this class became owners of farm land thru tenancy.[9]

To what extent were the conditions favorable for tenants to become landowning farmers? The data presented in Table VIII may help to answer this question. Out of the total of 721 purchasers, 13.8 per cent were tenants who were buying land for the first time. Of 86 living on farms, 74 were buying for the purpose of production. If we may consider that these 74 tenants buying for production were really trying to become landowning farmers, then only 10.3 per cent of the total purchasers of farm land were tenants becoming, or attempting to become, landowning farmers. Taking the data as a whole, it does not appear that tenants were becoming landowning farmers at a rate which could be considered encouraging, and it is doubtful if the number of tenants becoming landowning farmers during this period has affected materially the present situation relative to tenancy. Perhaps this may be more readily understood by observing the ratio of tenants to owners.

In 1880 there were 29 tenants for every 100 owners.[10] This ratio increased to 86 tenants per 100 owners in 1920. The trend of the curve (Fig. 3) from 1880 to 1910, if extended, would indicate what was to be expected in 1920. That it approximated what would be expected indicates strongly that the activity did not impede or favor the acquisition of land by tenants. (Table IX)

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[9] Non-farmers, so-called, were those who at the time these data were gathered were not making farming their principal occupation, but rather were engaged primarily in some other business.

[10] These data include croppers. In this region a cropper is one who works tobacco land for a share of the crop. He is not a tenant as that word ordinarily is understood. He is rather a farm laborer who takes a part of the tobacco crop as pay for his labor. The increase in tenancy as indicated by the census data is due to a large extent to the rapid expansion of the tobacco area. Compare tables I and IX.

Table IX.—Number of owners, tenants, per cent of tenancy, and number of tenants per 100 owners from 1880 to 1920.

COUNTY	1880			1890			1900			1910			1920		
	Owners	Tenants	Per cent tenancy	Owners	Tenants	Per cent tenancy	Owners	Tenants	Per cent tenancy	Owners	Tenants	Per cent tenancy	Owners	Tenants	Per cent tenancy
Bourbon	722	210	22.5	728	320	30.5	753	670	47.1	726	670	48.0	812	1074	56.9
Clark	988	226	18.6	918	271	22.8	971	402	29.3	943	573	37.8	953	703	42.4
Fayette	733	338	31.5	634	431	40.5	691	554	44.5	745	660	47.0	905	1073	54.2
Jessamine	701	195	21.8	677	254	27.3	670	283	29.4	802	483	37.6	764	770	50.2
Madison	1660	388	18.9	1808	538	22.9	2047	694	25.3	2333	1437	38.1	2284	1274	35.8
Scott	1053	284	21.2	1008	533	34.6	1097	824	42.9	1099	815	42.6	1295	891	40.8
Woodford	445	216	32.7	422	252	37.4	543	510	48.4	532	601	53.0	576	775	57.4
Totals	6302	1857	22.8	6195	2599	29.5	6772	3937	36.8	7180	5239	42.2	7589	6560	46.4
Tenants per 100 owners		29			42			58			73			86	

THE MOTIVES OF SALE AND PURCHASE

Inspection of the data presented in Tables X and XI, indicates in a rather striking manner that speculation was an important feature of the activity. It is evident that farmers, as a class, were less active in speculative purchases than non-farmers, provided that speculative activity is measured by the per cent of total purchases.[11] For example, about 31 per cent of the purchases made by farmers could be designated as speculative purchases, while about 62 per cent of the purchases made by non-farmers fell into this class. It should be remembered, however, that the total speculative purchases made by farmers exceeded in number the total speculative purchases made by non-farmers.

Table X.—Number of farms purchased and number of individuals purchasing for certain specified reasons, classified according to farmers and non-farmers.

Reason for Purchase.	Farmers				Non-farmers				Total			
	No. of purchases.	No. of purchasers.	Per cent of purchases.	Per cent of purchasers.	No. of purchases.	No. of purchasers.	Per cent of purchases.	Per cent of purchasers.	No. of purchases.	No. of purchasers.	Per cent of purchases.	Per cent of purchasers.
Production	493	476	62.3	65.6	43	34	28.9	33.3	536	510	57.0	61.67
Speculation	186	144	23.5	19.8	92	63	61.7	61.8	278	207	29.6	25.03
Production and speculation mixed	80	81	10.1	11.0	......	......	......	......	80	81	8.5	9.79
Investment	13	13	1.6	1.9	8	4	5.4	3.9	21	17	2.3	2.06
Adding to estate	10	7	1.3	1.0	6	1	4.0	1.0	16	8	1.6	.97
Miscellaneous	2	3	.3	.5	......	......	......	......	2	3	.2	.36
Not specified	7	1	.9	.2	......	......	......	......	7	1	.8	.12
Total	791	725	100.0	100.0	149	102	100.0	100.0	940	827	100.0	100.0

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[11] Purchases or sales were not designated as speculative unless the land had been purchased with the express purpose of reselling at a profit. Sales made by individuals who had owned the land for a period of years or before the period of activity, were not classed as speculative sales.

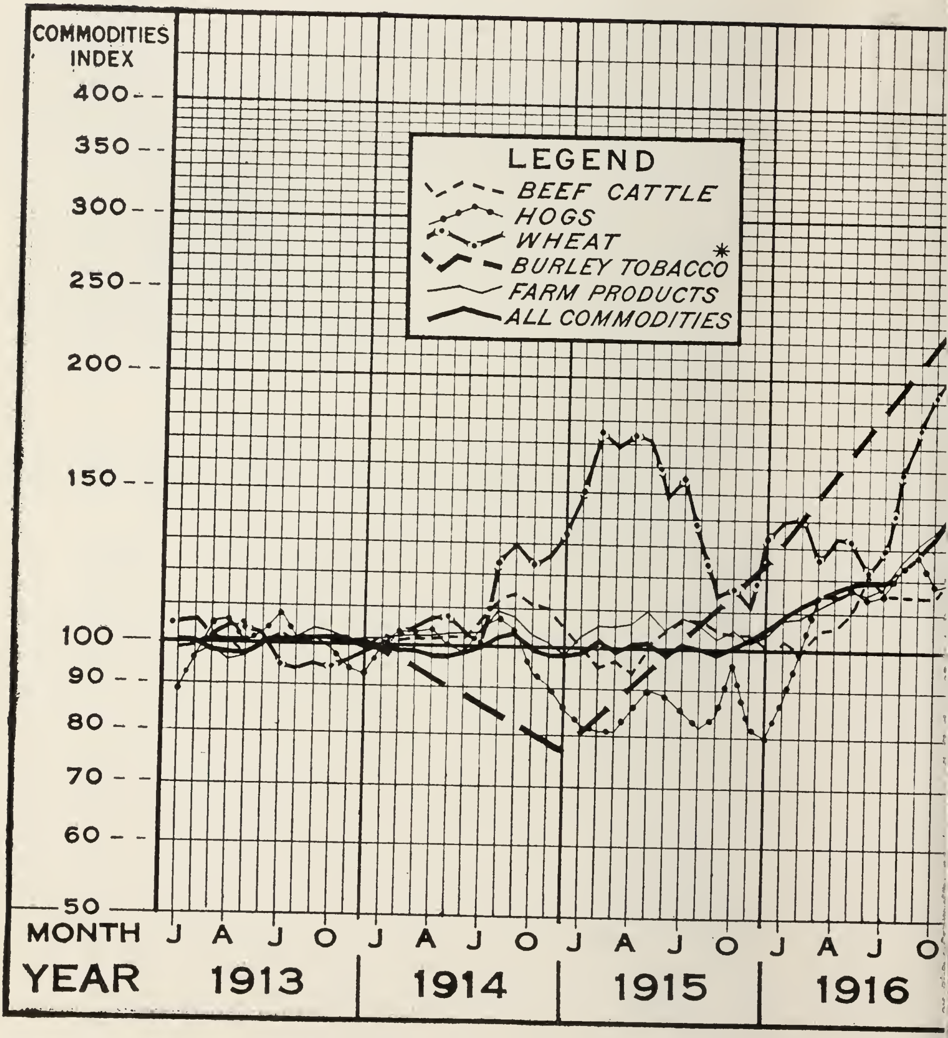
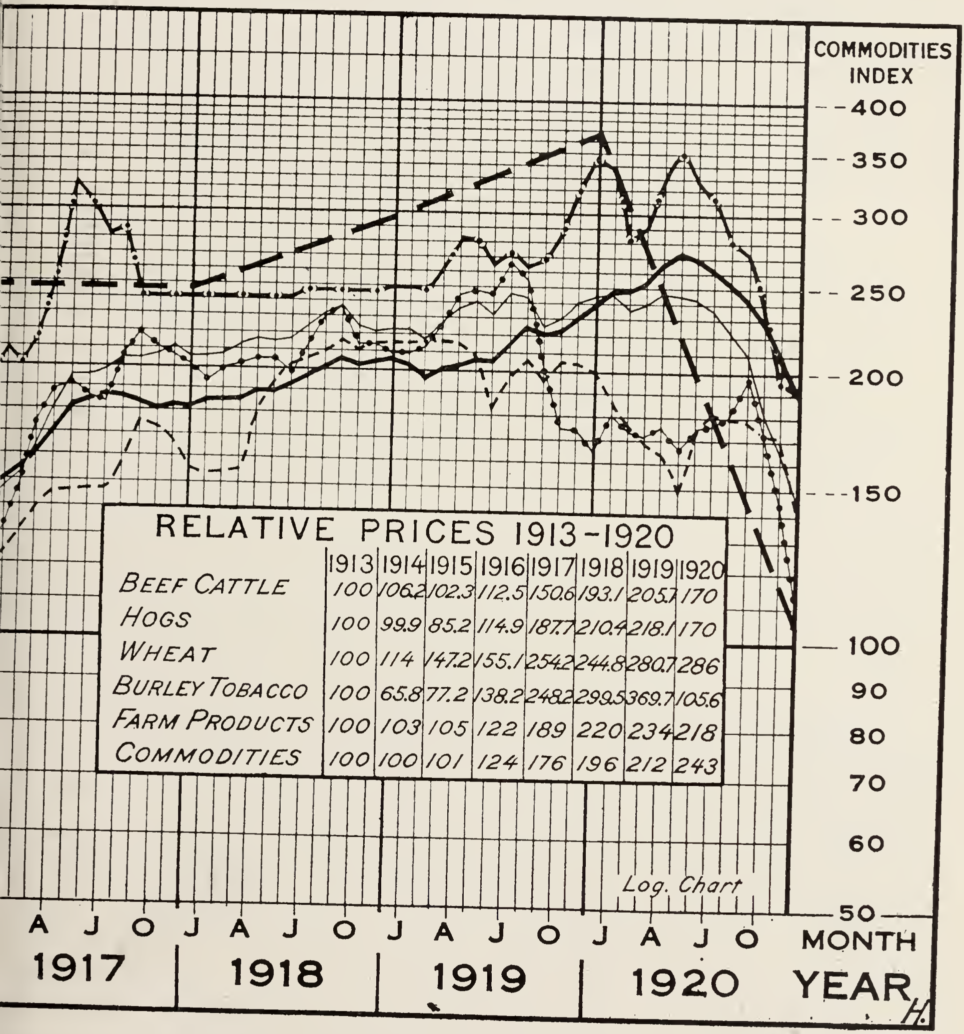


FIG. 4 TREND OF PRICES OF BEEF CATTLE, HOGS, WHEAT, TOBACCO, FARM P
INDEX, EC

*Wholesale price indices as of the Department of Labor, except Burley tobacco, wh



RELATIVE PRICES 1913-1920

	1913	1914	1915	1916	1917	1918	1919	1920
BEEF CATTLE	100	106.2	102.3	112.5	150.6	193.1	205.7	170
HOGS	100	99.9	85.2	114.9	187.7	210.4	218.1	170
WHEAT	100	114	147.2	155.1	254.2	244.8	280.7	286
BURLEY TOBACCO	100	65.8	77.2	138.2	248.2	299.5	369.7	105.6
FARM PRODUCTS	100	103	105	122	189	220	234	218
COMMODITIES	100	100	101	124	176	196	212	243

DUCTS, AND ALL COMMODITIES. UNITED STATES 1913-1920. BUREAU OF LABOR
L 100.

is based on reports from Lexington, Winchester, Richmond and Paris markets.

Table XI.—Number of farms sold and the number of individuals selling for certain specified reasons classified according to farmers and non-farmers.

REASON FOR SALE	Farmers				Non-farmers				Total			
	No. of sales.	No. of sellers.	Per cent of sales.	Per cent of sellers.	No. of sales.	No. of sellers.	Per cent of sales.	Per cent of sellers.	No. of sales.	No. of sellers.	Per cent of sales.	Per cent of sellers.
Speculation	374	250	50.2	45.0	97	64	50.6	63.366	471	314	50.1	47.6
Retiring	117	100	15.7	18.0	5	5	2.6	4.950	122	105	13.0	16.0
Estates sold	38	17	5.1	3.1	52	6	27.1	5.940	90	23	9.6	3.5
To buy larger or better farm	66	60	8.4	10.8	2	2	1.0	1.980	68	62	7.2	9.4
To secure investment profits	54	39	7.2	7.0	9	9	4.7	8.910	63	48	6.7	7.3
For reinvestment	29	24	3.9	4.3	11	7	5.7	6.938	40	31	4.3	4.7
Payment of debt	24	23	3.2	4.1	2	1	1.0	.990	26	24	2.8	3.5
Miscellaneous	31	31	4.3	5.6	8	3	4.2	2.970	39	34	4.1	5.2
Not specified	15	12	2.0	2.1	6	4	3.1	3.960	21	16	2.2	2.8
Totals	748	556	100.0	100.0	192	101	100.0	100.004	940	657	100.0	100.0

The majority of purchasers were buying for the purposes of production. This is substantiated by the fact that 61.67 per cent of the buyers stated that they intended to use the farm purchased for production. Farmers, as a class, led in the purchase of farms for this purpose. Of the 791 farms purchased by farmers, 493 or 62.3 per cent were purchased for the purpose of production; on the other hand, only 43 out of 149, or about 30 per cent of the farms purchased by non-farmers, were for the purpose of production.

To gain speculation profits was apparently the dominating motive which impelled sellers to action, as 50.1 per cent of the total sales were made for this purpose. The farmers and non-farmers were engaged to about the same extent in this kind of activity. It should be pointed out, however, that the number of farms purchased for speculation by farmers far exceed in number those purchased by non-farmers. It should also be stated that in addition to purely speculative transactions there were others which were speculative in character. This apparently was true in some cases where farm land had been sold for the purpose of securing investment profit. In this same category, undoubtedly, should be placed some of the sales which were made to liquidate for reinvestment in some other business.

TERMS OF SALE

In the event that a period of rapidly increasing land prices be followed by a period of falling prices of agricultural commodities, those who buy on a narrow cash margin are likely to find themselves in a more precarious condition than those who pay a substantial portion of the purchase price in cash. In order to determine the proportion of the purchasers paying cash as compared with those who were paying part cash, data were gathered showing the terms of sale in the case of 842 transfers of land.

Table XII.—Per cent of purchase price paid in cash and length of deferred payments.

Length of deferred payments.	Amount paid in cash						Total	
	25 per cent	33 1-3 per cent	50 per cent	50-75 per cent	75-100 per cent	100 per cent	Number	Per cent
All cash	....	....	....	....	....	176	176	20.9
1 year	1	3	14	7	6	....	31	3.7
1–2 years	7	218	76	32	6	....	339	40.3
1—2—3 years	8	195	23	7	2	....	235	27.9
1—2—3—4 years	5	15	13	8	1	....	42	5.0
Over 4 years	3	11	5	....	....	....	19	2.2
Totals	24	442	131	54	15	176	842	100.0
Per cent	2.9	52.5	15.5	6.4	1.8	20.9	100	

AMOUNT PAID IN CASH

The data regarding cash payment are shown in Table XII. The per cent of the purchase price paid in cash varied from 25 per cent to 100 per cent. In many cases initial cash payments as low as 10 per cent were made, with the understanding that in addition to this 10 per cent, 23 1-3 per cent was to be paid on March first, or on taking possession of the farm. Fifty-two per cent of the sales involved a cash payment of 33 1-3 per cent of the purchase price. Sales which involved the payment of one-half of the purchase price amounted to 15 per cent of all the sales. Full cash payments were made in 176 transfers, or 20.9 per cent of all the sales.[12]

AMOUNT OF INDEBTEDNESS

It is evident from these data that a considerable indebtedness has been incurred. The most common terms of sale were 33⅓ per cent of the purchase price in cash, with the balance due in one and two, or one, two, three and four years. Deferred payments extended to four years in only 42 cases, and over four years in 19 cases. This indebtedness was to be paid in equal annual installments plus the accrued interest at 6 per cent. In most cases the deed was so worded that if the purchaser failed to meet any one of these annual payments with interest due at the time specified, all payments became due and collectible at once. It should not be inferred, however, that extension of time might not be granted to the purchasers. In fact, it is the custom in the region, wherever possible, to extend a number of years in which the debt may be paid off.

Practically all the lien notes were held by the sellers, banks or trust companies. A few notes were held by retired farmers. Banks were not advancing money to the purchaser for the purpose of meeting his annual payments unless a substantial portion of the purchase price had been paid in cash. In case one-half or more of the purchase price had been paid in cash, the bankers indicated a willingness to advance money to the purchaser for the purpose of meeting his annual payments. It appears doubtful if the bankers would be willing to advance money if only one-third or less of the purchase price had been paid in cash. This being the case, over 55 per cent of those purchasing farm lands will not be able to get money from the banks in case they are not able to make their annual payments.

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[12] Doubtless in some of these cases, a part of the purchase price was borrowed.

FACTORS INFLUENCING THE PRICE OF LAND

Earnings from Farm Land as a Factor Influencing the Price

One of the most common reasons advanced to account for the high land prices was that farm earnings, due to high prices received for farm products generally and tobacco in particular, had reached a point which justified the prices paid. Investigation shows that farm earnings did increase during the war period. As evidence of this, figures are presented in Table XIII showing the net rent received by 150 farmers who were renting their entire farms out to tenants. The average rate of return on the estimated value of the capital invested in real estate for 80 share-rented farms was 9.44 per cent, while the average net rent was $22.55 per acre. The majority of these 80 farms were returning a rate of return above the average.

The average net rent per acre for 45 farms rented on the cash basis in 1919 was $10.31, and $12.77 per acre for 19 farms in 1920. In the case of these cash-rented farms the average rate of return for the capital invested in real estate was 4.42 per cent in 1919 and 4.65 per cent in 1920. Thirty-two of the 45 farms returned a rate in excess of 4 per cent. As for farms rented for cash in 1920, only four returned a rate of less than 3 per cent, while fifteen returned a rate in excess of 4 per cent. As would be expected, the rate of net returns and the net rent per acre were less in the case of cash or share-cash-rented farms than those for share-rented farms. The difference is due in part to the fact that farmers who rent their farms for cash are relieved of a considerable portion of the risk normally involved in share renting, and in part to the increase in the prices of agricultural commodities.[13]

The data presented above are substantiated by the farm earnings on 52 farms, as determined by a careful analysis of the entire farm business. In 1919 these farms returned a rate of 8.45 per cent on the capital invested. While the average net re-

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[13] It is interesting to note that in 516 cash-rented farms in 1919 in this region the average cash rent was $8.62 and the rate of return on capital in land was 4.34 per cent (census data).

Table XIII.—Rates of interest received on capital invested in farms, rented on share, share-cash and cash basis.

INTEREST ON CAPITAL.	Share—1919				Cash—1919				Share-cash—1919				Cash—1920			
	Number	Average rent	Average net rent per acre	Average rate, per cent	Number	Average rent	Average net rent per acre	Average rate, per cent	Number	Average rent	Average net rent per acre	Average rate, per cent	Number	Average rent	Average net rent per acre	Average rate, per cent
Under 3 per cent	3	$1,400	$3.23	1.18	13	$1,378	$5.69	2.29	1	$935	$5.50	2.	4	$3,727	$9.24	2.92
3 per cent—under 6	6	2,803	13.05	3.60	20	3,909	9.04	4.08					9	3,640	11.70	4.21
6 per cent—under 9	21	7,195	21.16	7.8	8	5,602	19.59	7.82	4	3,466	13.28	6.9	3	7,584	15.23	6.44
9 per cent—under 12	21	5,977	22.55	10.02												
12 per cent—under 15	10	7,734	35.15	13.65	1	2,500	31.25	12.5					1	1,300	43.33	14.45
15 per cent—under 18	8	7,213	31.91	15.65	1	1,311	45.70	15.9								
18 per cent—under 21	4	3,421	39.32	19.45												
21 per cent—under 24	3	3,843	26.87	22.66												
Over 24 per cent	4	7,331	150.00	35.17	2	731	81.24	28.5	1	9,754	107.20	28.6	2	2,975	126.59	26.3
Totals	80	$6,088	$22.55	9.44	45	$3,250	$10.31	4.42	6	$4,092	$18.09	8.7	19	$4,088	$12.77	4.65

turn per acre was $29, 55 per cent of the farms were above the average, both as to the rate of return on the capital and the net return per acre.

On the whole it may be inferred that agricultural production in this region was exceptionally profitable during 1919 and 1920 and this undoubtedly had a great influence on the prices paid for farm land. The danger lies in taking the income for any one or even two years as a basis for ascertaining the price which should be paid for farm land.

Generally speaking, the net rent attributable to the land is what determines its value. If the net rent is low, the value tends to be low. If the net rent is high, the value tends to be high, provided that the rate of interest at which the net rent is capitalized remains the same. It is sometimes said that the capital value of a piece of land is found by capitalizing the net rent at a normal rate of interest.[14] In determining the capital value of land, however, the probable future rents must be considered and it is not wise to say that the value of a piece of land is determined by the returns for a single year, unless it is certain that the return is a normal one and probably will continue to be received for an indefinite period.

Table XIV.—Average net returns[1] per acre, and average rate of return on capital invested in farming on 115 farms in Scott and Madison Counties in 1913.

Net return per acre.	No. of Rec.	Acres	Av. net return per acre	Av. rate of return per cent
Less than $5	59	377.02	$2.21	3.36
$5—$10	32	399.46	7.07	6.24
$10—$15	12	332.33	11.62	9.75
$15—$20	9	140.00	17.61	10.73
Over $20	3	57.66	30.69	12.10
Average	115	351.71	$5.27	4.13

[1] Net returns were calculated by deducting the estimated value of the farm labor from the farm income.

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[14] To find the present capital value of an acre of land divide the net rent by the rate of interest.

That the returns from farming in this region were not as large in years prior to the period of activity is substantiated by the data presented in Table XIV. The average net return on the total capital invested in the farm business in the case of 115 farms was $5.27 per acre, while the average rate of return was 4.13 per cent. Seventy-nine per cent of the farms rented less than 10 dollars, net, per acre. Such facts ought to be considered in attempting to arrive at a fair price for farm lands.

The Influence of Tobacco Prices on the Prices Paid for Farm Lands

As already pointed out, one of the most important factors influencing prices paid for farm land was the remarkable profit secured from tobacco during the seasons of 1918 and 1919, owing to unusually high prices. The average farm price on December 1, 1913, for White Burley tobacco was 12.3[15] cents per pound. The 1919 crop sold for an average price of 45.48 cents per pound,[16] thus showing an increase of 269 per cent since 1913.

During the same period the cost of producing tobacco did not increase as rapidly as did the price. The cost of producing a pound of White Burley tobacco in this region in 1913 was 12.7 cents,[17] while the cost of production in 1919 was 26 cents.[18] Thus while there was an increase of 269 per cent in the price of tobacco there was only an increase of 104 per cent in the cost of production.[19] That the price of tobacco increased faster than did the cost of production is evidenced by the large profits which were realized from the production of tobacco during the two or three years preceding 1920. This is shown in Table XV. Such profits, however, were not realized for the 1920 crop. (See Table XVI).

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[15] Yearbook U. S. D. A., 1913.

[16] Average price on Lexington, Winchester, Paris and Richmond markets.

[17] U. S. Dept., Bulletin 482, page 25.

[18] Kentucky Bulletin 229, page 173.

[19] It should be pointed out that these two sets of data are not strictly comparable, owing to the different methods of obtaining them. They are, nevertheless, highly suggestive, and indicate that the cost of production lagged behind the price of tobacco.

Table XV.—Net gain per acre received from land in tobacco on 81 farms in the Bluegrass Region, with range in acreage, average receipts, expenses and gain per farm for 1919.

Range in Tobacco Acreage	Average acres of tobacco per farm.	No. of farms.	Per cent of farm acreage in tobacco.	Average receipts per farm.	Average Expense per farm[1]	Average gain per farm.	Average net gain per acre 1919.
Under 5 acres	3.05	32	3.5	$1,562.50	$540.00	$1,022.50	$335.50
5—10 acres	7.4	27	11.93	4,245.00	1,324.00	2,921.00	395.00
10—15 acres	12.3	17	13.22	9,055.00	2,398.00	6,657.00	540.00
15—20 acres	17.1	2	6.98	17,614.39	3,443.78	14,170.61	829.00
Over 20 acres	28.06	3	7.57	20,851.41	6,126.94	14,720.47	525.00
Average	7.72	81	8.0	$5,140.00	$1,470.00	$3,670.00	$476.00

[1] Includes every expense except land rent.

Table XVI.—Net loss per acre from land in tobacco on 74 farms in the Bluegrass Region, with range in acreage, average receipts, expenses and loss per farm for 1920 crop.

Range in Tobacco Acreage.	Av. acreage of tobacco per farm.	No. of farms.	Average receipts per farm.	Average expense per farm.[1]	Average loss per farm.	Average net loss per acre 1920.
Under 5	3.06	27	$340.65	$596.89	$256.24	$83.74
5—10	7.06	27	1,087.11	1,323.91	236.80	33.54
10—15	11.69	13	1,895.40	2,218.92	323.52	27.67
15—20	15.17	3	1,788.14	2,562.44	774.30	51.04
Over 20	22.98	4	3,870.77	4,491.97	621.20	27.03
Average	7.6	74	$1,135.64	$1,437.34	$301.70	$39.70

[1] Includes all expenses except land rent.

The Inflation of the Currency and Its Effect on Land Prices

A prevalent opinion was that the rapid advance in land prices was due in part, if not entirely, to the depreciation in the purchasing power of the dollar. It should be understood, however, that the value of a piece of land is dependent largely upon the net earnings which can be attributed to it. The magnitude of these earnings is dependent upon two things, (1) the cost of production and (2) the prices paid for the commodities produced. The purchasing power of such net income is determined by the general price level.[20] If the price of a farm product should be doubled because of inflation and, at the same time, the cost of production should also double, then the net earnings will be doubled. If, however, the cost of production does not increase as rapidly as the rise in prices of commodities produced, then the net earnings attributable to the land will be more than doubled. On the other hand, if the cost of production increased more rapidly than the prices, the net earnings will be less than double.

A third factor to be considered is the rate of interest at which the net earnings attributable to land are to be capitalized. If the net earnings of a piece of land remain the same, an advance in the interest rate means a lower capital value; while lowering the interest rate means a higher capital value for the land. If, during a period of inflation, the rate of interest at which the net earnings are capitalized increases, this would tend to lower the capital value. Farmers have shown a strong tendency to be willing to accept a rate of interest lower than a current rate, believing that the difference in the two rates would be made up by the increases in the value of the land, by residential advantages and by other benefits. The willingness on the part of farmers to accept a low rate of interest has tended to make the price of land higher than the economic rent alone would seem to justify.

Persons who purchased land during this period believing that its value varied inversely with the purchasing power of the dollar, may find that they have invested their money unwisely. While it is true that during a period of inflation prices of farm products are likely to advance more rapidly than the cost of production, thus making payment of debt easier, it is equally true that during a period of deflation prices are likely to fall more rapidly than the cost of production, thus making the payment of debts difficult and sometimes impossible.

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[20] Purchasing power of net incomes could be determined by dividing such incomes by the index of the prices of all commodities.

Land Speculation in Relation to Land Prices

There seems to be a common belief that in some way speculative buying and selling has an effect on the prices paid for land. This belief no doubt is attributable to the fact that high prices are usually accompanied by land speculation. Speculation must, however, be looked upon, in a large measure, as an effect rather than a cause of high prices. It is true, of course, that people will yield to illusions created by certain shrewd and cunning promoters and to the extent that this is true speculation must be considered a cause of high prices. In the main, however, it would appear that people were moved to buy because they believed that the earnings of the land justified the prices paid.

Miscellaneous Causes

The counties of central Kentucky always have been looked upon by farmers living in the eastern tier of counties as a highly desirable place in which to live. It was natural enough then, when coal, oil and other minerals were discovered in these outlaying counties, that farmers should begin to move to the Bluegrass Region. Many of these farmers, well supplied with money, were quite willing to pay good prices for land about which they had heard so much and which they desired so intensely. The buying of farm land by these persons exerted an appreciable influence on the prices paid for land.

Thruout its history the Bluegrass Region has been occupied by farmers who attached a great deal of significance to land ownership, aside from its income-producing power. The result of this has been the formation of several large and many small estates. The building up of these has in the past exerted an influence on the prices of land. The feeling exists, as strong as ever, that to own land in this region carries certain social advantages. This doubtless played its part in influencing the prices of farm land, especially where the hope was held out that land acquired could be paid for out of the earnings of tobacco in a relatively short time. Such factors, however, are hard to determine and their influence is difficult of measurement, yet their presence helps to explain why high prices were paid for farm land.

THE EFFECTS OF THE LAND BOOM

A full presentation of the effects of the recent activity in the Bluegrass Region of Kentucky can not be given at this time because several years must elapse before all the effects are fully registered on the prosperity of the region and the status of the agricultural workers. It is essential, however, to a study of this nature, to present at least such effects as thus far have been registered, in order that the situation may be properly understood.

FINANCIAL LOSSES INCURRED

It is now obvious that some unwise purchases were made during the period and in order to determine to what extent this was the case, data were gathered regarding 146 persons, all of whom were in financial difficulties. In obtaining these data, no attempt at a complete canvass of the situation was made. These 146 men are considered to be representative of others in a similar position. Bankers and others in close touch with the situation express the opinion that at least fifty per cent of those who bought land just prior to 1920 are in financial difficulties, and approximately ninety per cent of those who bought in 1920.

The data presented in Table XVI give an idea of the nature of the action which was taken in regard to those who were unable to meet their deferred payments. Thirty-eight of the 146 voluntarily deeded back the farm to the former owner, thus incurring cash losses which averaged $9,356. It should be remembered that some buyers had made improvements in the way of erecting buildings, the value of which should be added to the cash payment to determine the total financial loss.

Table XVII.—Action taken in the case of 146 purchasers who were unable to meet their payments on March 1, 1921.

Group I—First experience as owners (Individuals becoming owners for the first time.)

Action	No. of farms.	Average size (acres)	Average purchase price	Average of cash payment	Average amt. of indebtedness	No. of years allowed to pay out					
						1	2	3	4	5	6
Cancellation	19	90	$19,476	$5,678	$13,798	1	9	4	2	2	1
Time extended	37	70	18,318	7,285	11,033	4	13	14	4	2	......
Sued	1	81	34,000	10,000	24,000	......	1	......	......	......	......
Sold Farm	3	84	24,999	11,450	13,549	......	2	1	......	......	......
Miscellaneous	2	48	9,656	3,031	6,625	......	1	1	......	......	......
Action pending	6	104	24,818	8,524	16,294	2	1	3	......	......	......
Total or average	68	79	$19,486	$7,044	$12,442	7	27	23	6	4	1
Group II.—More than one year as owners.											
Cancellation	19	133	$38,814	$13,034	$25,780	1	5	11	1	......	1
Time extended	24	91	28,672	10,324	18,348	2	11	8	2	1	......
Sued	3	175	30,947	6,250	24,697	......	1	1	......	1	......
Sold Farm	6	103	32,630	7,122	25,508	......	2	......	3	1	......
Action pending	12	131	39,295	15,019	24,276	1	6	2	2	......	1
Total or average	64	116	$34,152	$11,518	$22,634	4	25	22	8	3	2
Group III. Experience as to ownership not specified.											
Time extended	4	102	$30,995	$12,268	$18,727	1	......	3	......	......	......
Sued	2	70	26,848	8,783	18,065	......	......	2	......	......	......
Sold Farm	4	119	33,653	9,006	24,647	......	2	......	1	1	......
Action pending	4	38	11,713	4,450	7,263	......	1	3	......	......	......
Total or average	14	84	$25,652	$8,603	$17,048	1	3	8	1	1	......
Summary.											
Cancellation	38	111	$29,145	$9,356	$19,789	2	14	15	3	2	2
Time extended	65	80	22,921	8,714	14,207	7	24	25	6	3	0
Sued	6	124	30,089	7,719	22,370	0	2	3	......	1	0
Sold Farm	13	103	31,184	8,700	22,484	0	6	1	4	2	0
Miscellaneous	2	48	9,656	3,031	6,625	......	1	1	......	......	0
Action pending	22	107	30,331	11,325	19,006	3	8	8	2	......	1
Total (average)	146	95	$26,506	$9,155	$17,356	12	55	53	15	8	3

Table XVIII.—Farm income of 176 farmers operating under normal conditions.[1]

SIZE OF FARM.	No. of records.	Farm Income.		
		Average.	Range.	Per cent over average.
Less than 100 acres	16	$1,045	—$298 to $3,100	37.5
100-200 acres	45	1,448	—748 to 3,591	42.2
200-300 acres	50	2,185	151 to 4,951	40.6
300-400 acres	26	2,325	—202 to 6,219	46.1
Over 400 acres	39	5,080	538 to 15,908	30.8

[1] Data obtained in connection with Farm Management Survey conducted in 1914.

If the purchaser was able to pay the interest, or the interest and part of the principal, the seller was inclined to allow an extension of time. This extension of time was usually for one year, but in a few cases an indefinite period was granted provided the purchaser could meet his interest payments promptly. Of the 146 cases, 44.5 per cent represented buyers who were being given extensions of time. These had made an average cash payment of $8,714, with an average indebtedness of $14,207. In 54 out of these 65 cases, the indebtedness was to be paid off in three years or less.

A few purchasers were trying to sell their farms in an attempt to meet their financial obligations. Most of these attempts, however, resulted in failure, because there was no market for the land at prices high enough to bring even sufficient funds to liquidate the deferred payments.

Suit against purchasers for failure to meet deferred payments was not generally instituted. Suit was brought only in cases in which the purchaser refused to do anything regarding the payment of interest or principal, or had other property which could be attached.

In addition to cases of cancellations, extension of time, farms sold and individuals being sued, a number of cases of purchasers in financial difficulties, on which no action had been taken, were still pending.

Table XIX.—Interest on deferred payments at 6 per cent for 113 individuals in financial difficulties.

SIZE OF FARM.	No. of records.	Interest on Deferred Payments at 6 per cent.		
		Average.	Range.	Pre cent over average.
Less than 100 acres	75	$609	$60-$2,100	43
100-200 acres	31	1,487	240- 3,080	42
200-300 acres	4	2,095	1,542- 2,883	50
300-400 acres	3	1,860	1,206- 2,723	67

The income-producing power of those in financial difficulty is not known and for that reason their ability to meet their financial obligations can only be conjectured. However, some idea as to whether or not these individuals will be able to pay for their farms may be gained by studying the data presented in Tables XVIII and XIX.[21]

Assuming that the data presented in these tables are comparable, it would seem that the majority of the purchasers would be able to pay the interest on their indebtedness and, to some extent, liquidate the principal. If, however, the majority are to pay for their farms, the number of years in which payment may be made must be extended.

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[21] Farm income, as determined from farm management survey records, is the difference beween receipts and expenses, with due regard to accruals and deferrd charges as ordinarily understood in business practis. The receipts consist of the actual cash received for products sold from the farm, the value of services rendered and the money value of increase in inventory. The expenses consist of all cash payments actually made belonging to the year's business (allowing for those costs of the year's business which may not have been paid but stood as charges at the end of the year), for the value of the services of the members of the family other than the operator himself, for depreciation of buildings and equipment and the decrease, if any, in the money value of the inventory. In this connection it should be pointed out that the farmer's own labor and interest on the value of the farm property are not included in the expenses. The farm income represents a fund for current family use which the farmer cannot overdraw without impairing his capital. It should be understood, also, that because of interest on indebtedness and because an ample part of the farm income is often in goods rather than in cash and the current financial needs of the business must be paid out of this income, it does not represent a sum altogether available for living expenses or paying debts. It is rather the gross profit of the farm as a business.

It is true, of course, that some of the purchasers will be able to pay off their indebtedness in the time stated in the agreement. However, whether or not the majority of the purchasers will be able to pay for their farms will depend to a large extent upon the economic conditions as they affect agriculture. The data presented in Table XVIII represent normal conditions. This should be understood clearly in making comparisons of the data presented in Tables XVIII and XIX.

The material presented in Table XX furnishes information relative to the progress made by tenants in their attempt to become permanent landowning farmers. It has been pointed out that the data available indicate that there is no sound reason for believing that tenants made any progress in becoming landowning farmers. This contention is substantiated by the cases under consideration. Of 146 cases, 44 were tenants just before their purchase. The records show that 16 of these voluntarily gave up their farms, suffering an average cash loss of $5,678; 26 had to be given an extension of time, while two sold their farms because they were unable to meet their payments.

LIBERAL CREDIT SYSTEM

It has been said that the present situation could be relieved materially if a more liberal credit system were established, which would permit individuals to buy land on a larger margin of credit than is permitted by existing agencies, including the Federal Farm Loan System. The establishment of such a credit system doubtless would help individuals possessing exceptional ability. There is reason to believe, however, that a liberal credit system thru which loans could be produced at a lower rate than that charged by existing credit agencies would stimulate the demand for land to such an extent that it would be over-capitalized. Everything considered, it would appear that an improved credit system, however useful as an emergency measure, would not furnish a remedy for the present situation nor would it prevent the recurrence of high land prices. The solution of the present difficulties would seem to lie in the utilization of the

Table XX.—Agricultural experience, occupation and residence, and reason for purchasing of 146 individuals who were unable to meet their payments on March 1, 1921.

ACTION.	No. of records.	Agr. Experience.			Occupation, Farmers.	Reason for Purchase.		
		Av. age.	Tenant.	Non-tenant.		Production.	Speculation.	Not Specified.
FIRST EXPERIENCE AS OWNERS								
Cancellation	19	37	16	3	19	18	....	1
Time extended	37	40	26	11	37	36	1	....
Sued	1	42	....	1	1	1	....	....
Action pending	6	46	....	6	6	4	1	1
Sold farm	3	36	2	1	3	2	1	....
Action miscellaneous	2	48	....	2	2	2	....	....
Sub-total	68	40	44	24	68	63	3	2
MORE THAN ONE YEAR AS OWNERS.								
Cancellation	19	49	....	19	19	7	11	1
Time extended	24	47	1	23	24	17	7	....
Sued	3	44	....	3	3	1	1	1
Action pending	12	42	3	9	12	9	3	....
Sold farm	6	48	....	6	6	5	1	....
Sub-total	64	46	4	60	64	39	23	2
EXPERIENCE AS TO OWNERSHIP NOT SPECIFIED.								
Time extended	4	48	1	3	4	3	....	1
Sued	2	45	1	1	2	....	....	2
Action pending	4	50	1	3	4	2	1	1
Sold farm	4	39	....	4	4	2	2	....
Sub-total	14	46	3	11	14	7	3	4
Total	146	43	51	95	146	109	29	8

existing credit agencies rather than in the establishment of a new system. In those cases where the individuals have paid a large part of the purchase price in cash and are able to meet their interest payments, together with small payments on the principal, it would seem advisable to extend the number of years in which these deferred payments could be made.

Kentucky
Agricultural Experiment Station

University of Kentucky

THE WHITE FLIES OF HOTHOUSES

BULLETIN NO. 241

(RESEARCH BULLETIN)

MDCCCLXV

Lexington, Ky.
April, 1922.

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*Assigned by U. S. Dept. of Agriculture.

BULLETIN NO. 241
(RESEARCH BULLETIN)

THE WHITE FLIES OF HOTHOUSES

Asterochiton Abutilonea*
By H. GARMAN

Asterochiton Vaporariorum
By H. H. JEWETT

During the past fifteen years gardeners and florists in Kentucky have become familiar with very small, white, sucking insects appearing in great numbers on leaves of plants grown under glass and becoming a very serious pest, difficult to destroy and, at their worst, rendering unsightly and valueless most of the plants in a house. The exact date of their appearance in Kentucky as hothouse insects cannot now be determined. It is probable that one of our two species was introduced with infested plants from time to time before our attention was drawn to it. In 1908 and 1909 it appeared in destructive numbers in one of the Station hothouses and some attention was then given to the life history and habits. It was found that not one but two species were working on hothouse plants, sometimes one, sometimes the other predominating, but because of their small size passing with practical men and others not very familiar with insects as one species. At first a species with banded wings was most numerous; later this insect became less common and another with pure white wings predominated, tho the species with banded wings (*Asterochiton abutilonea*) could be found at all times with the other (*A. vaporariorum*) in small numbers.

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*Drawings and figures by and under the direction of H. Garman, Head of the Department of Entomology and Botany.

Details of the investigation on **Asterochiton vaporariorum** carried out by H. H. Jewett, research Assistant Entomologist, Department of Entomology and Botany.

The two insects belong to the same family as the notorious citrus fly (*Dialeurodes citri*) of orange trees in Florida and other southern states, and injure the plants in exactly the same way. In fact they are so much like the southern fly and so very small that ordinary observers would not recognize them as different. The adults, tho small, quickly attract attention because of their constant flitting about when plants are disturbed; they puncture the plants, but probably three-fourths or more of the injury is done by the singular scale-like young which, after a brief preliminary stage during which they have legs and creep about, settle down on the surfaces of the leaves, hundreds of them on a plant. One of the illustrations of *A. abutilonea* shows how thickly plants become covered with the young.

The banded-wing white fly of our hothouses is probably a native insect, occurring out-of-doors on a common weed known as velvet leaf (*Abutilon theophrasti*), but deserts this for other plants; and indoors it feeds on almost anything available, showing, however, a fondness for the leguminous plants. It was first observed on a Florida plant (*Sesbania macrocarpa*) grown from seed in the hothouse. It could not have been brought from the south, as no other southern plants were at the time grown in the house. Its invasion of hothouses is thus due to the presence of its favorite weed in the vicinity during the fall months when ventilators must be kept open, a fact suggesting an obvious preventive treatment.

The eggs of this species were observed in the Insectary in September, 1908, and recently hatched young obtained from them on the twenty-second of the month, minute objects with short, jointed legs, moving slowly over the leaves like the young of San Jose scale. The eggs are placed on the leaves somewhat irregularly, at times in perfect circles, again a few together, frequently scattered singly. Fresh eggs laid February 1, 1909, were pale yellowish, or greenish, glossy and, unlike those of *A. vaporariorum,* remained pallid, tho assuming finally a slight pinkish appearance, until hatched. They are to be distinguished, also, from those of *A. vaporariorum* by the stalk for attachment to the leaf tapering somewhat gradually into the body of the egg, and when attached the eggs are inclined with one side to the leaf, whereas in *A. vaporariorum* they stand erect or nearly so. The eggs measure 0.12 mm. in length and 0.10 mm. in diameter. Those laid February 1 did not hatch until February 12, but it was thought probable that the low temperature at which the house was kept delayed the development. Eggs were obtained again April 1, and hatched on the thirteenth of this month, the two observations together giving a period of about twelve days.

The young of *A. abutilonea* measure 0.37 mm. to 0.52 mm. in length, are translucent whitish, with a yellow spot on each side behind the middle of the body. As the insect settles down on the leaf it begins to secrete from close-placed round pores at its sides a marginal fringe which finally becomes the side wall of the pupa case. With growth other secretions appear at the dorsal edge of the body forming finally a fringe of translucent setae, and the whole central dorsal region of the integument becomes black, a feature by which it can be distinguished at a glance from *A. vaporariorum.*

A pupa case from red clover measures 0.86 mm. long and 0.50 mm. in width; the long marginal setae measure 0.34 mm. and short ones 0.14 mm. The central region is uneven and black, the operculum yellow.

Adults emerge as in the related species from a dorsal cleft extending from the front margin to the middle of the body, thence outward on each side to the margin. This opening closes after the winged fly comes forth and the case again looks like a perfect insect. Adults emerging January 22, 1909, stood erect on the cleft as they worked their way out, with their wings rolled into pads at the sides of the body. At this stage they were pure white, with the eyes red. Fifteen minutes after freeing themselves the wings were fully expanded, but still white. As the crust of the body became rigid after emerging the characteristic black markings appeared. Mature flies, as represented in the figures, have zig-zag cross bands on the front wings, the hind wings being unmarked, and an elongate mark at the base. The double eyes are black to ordinary inspection, but under a hand magnifier, dark red, the two parts separated by a narow white bridge, the dorsal division the smaller, the facets in sixes surounding an unpigmented central region. Ocelli are apparent on the head between the compound eyes. The claws of the feet are rather strongly divergent, acute, with a series of long hairs along one side. The median pulvillar structure is as long as the claws, slender, acute, but expanded and obliquely cut off at the tip. The terminal claspers of the male are broad, knife-like, acute; the median appendage is slender, curved, tapering, the tip somewhat hooked.

The white species (*A. vaporariorum*), to which most attention has been given may be recognized when mature, at once, under a magnifier, by being pure white, the only duskiness of consequence being a black tip of the rostrum, this feature, however, being present in *A. abutilonea*. The egg of *A. vaporariorum* is attached by a slender stalk and widens perceptibly at the base, thence contracting to the tip. It stands erect on the leaf instead of inclining toward it, and gradually assumes a decided purple hue before the young hatch.

A peculiar feature of both species, which is present also in other members of the family we have studied, is a powdery coat with which the whole body and wings are dusted. This powder produces the white hue of the insects, the real color beneath being honey-yellow, in great part. The purpose of this coating evidently is to protect the flies against moisture. Small insects like this but with smooth bodies sometimes become fatally stranded in droplets of water collecting on the leaves they frequent. The source of the waxy powder is extensive glandular developments of somites in the ventral side of the abdomen. Four of the basal somites of the male are thus modified, while two are present in the female. These remarkable structures are suggestive of the wax glands on the ventral side of the abdomen of the honey bee. The wax secreted is clawed off and transferred to the body and wings by the feet, somewhat as it is in the bee in making honeycomb. The figures represent the structures in *A. abutilonea,* but serve well for the glands on the body of the related insect.

The sexes of the insects are readily recognizable by these glands, but there are other features by which any one may tell them apart. The male has three conspicuous appendages at the tip of the abdomen, which are represented in figures 4, 5 and 6. The appendages on the female are less evident and are commonly turned upward and inward, out of the way. The male appendages of *A. vaporariorum* are less slender than those of *A. abutilonea* and the tips of the claspers are edged beneath, those of the male of the other species being plain in this region.

The following account of the transformations of *A. vaporariorum* is not presented as a completed work. The study was undertaken in the hope that some means might be found to destroy the insects in all their stages without doing harm to the plants. The adult flies can be destroyed readily enough, by some of the means suggested, but young are constantly hatching when a house has become thickly infested, and repeated fumigations are required to keep the flies from reinfesting the plants.

Two facts of primary importance in dealing with the insects have been learned in the course of our observations. *A. abutilonea* is an out-of-door insect, invading hothouses when given opportunity in the fall of the year. *A. vaporariorum* is practically a hothouse pest, and perishes in winter out-of-doors. Therefore, only when the native insect is permitted to become established in hothouses in the fall is it calculated to do mischief, and only when *A. vaporariorum* is brought in on plants. Knowing the source from which the insects come, there should be no great difficulty in preventing infestation of hothouses.

Asterochiton Vaporariorum

HABITS AND LIFE HISTORY

Few adults were to be found in the Insectary at the time this work was assigned in the latter part of January, 1914. The Insectary had been fumigated a few days previous to the assignment and but few immature individuals escaped the treatment. It has been found, however, that thru the cold winter months of this season, the insect was not as numerous as in the warmer months. The insect increases slowly thru the months of January, February, March and April, but after that time there is a very marked increase up to the colder weather in the fall.

DISSEMINATION AND HIBERNATION OF THE INSECT

The adults begin to appear outside the greenhouse about the first of May and may be found there until the heavy frosts in the fall. They do not fly to any great distances, and then in an irregular manner, but no doubt a few escape from the greenhouse by flying. A number of adults are sometimes taken out of the greenhouses on rubbish and on plants that are to be transplanted. The wind is a very important factor for carrying the adults short distances and is a chief agency for disseminating the insect. In the latter part of the summer, the insect may be found at considerable distances from greenhouses.

This species does not live outside of greenhouses, according to observations made during the winter season, and careful search did not result in the finding of the insect in any of its stages at that time. Hardy plants, bearing leaves on which were all stages of the insect, were placed outside the Insectary to determine the effect of cold on the insect. In a few days all the leaves were examined and all stages of the insect were found to be dead.

FOOD PLANTS

The insect is a very general feeder on greenhouse plants and it can live on a large number of plants outside of greenhouses during the summer months. Immature stages of the insect were found on the following plants, and no doubt there are many more on which it feeds: Bean, white lupine, Canfield pea, soybean, cowpea, sweet pea, bur clover, red clover, sweet clover, alfalfa, Lespedeza, hairy vetch, redbud, honey-locust, black locust, yellow-wood, rose, tobacco, potato, tomato, *Solanum nigrum,* muskmelon, cucumber, *Amaranthus spinosus,* lettuce, *Lactuca canadensis,* Chrysanthemum, *Ambrosia artemisiaefolia, aster,* Taraxacum, sp, Convolvulus sp, morning-glory, Ploygonum sp, Avalis, Geranium, *Lepidium virginicum, Malva rotundifolia, Sida spinosa,* Hibiscus sp, and Berberis.

FOOD PREFERENCES AND FEEDING HABITS

The insect, tho a very general feeder, prefers certain plants as food, noticeably, tomato, cucumber and muskmelon. These plants become literally covered with the insect in all its stages if remedial measures are neglected. The plants are greatly weakened and injured by its attacks. The excretions of the larvae, together with any excess moisture in the greenhouse, encourage fungus growth which, tho it may kill some of the larvae, hinders the respiration of the leaves and causes them to wither and die. Both the larvae and adults get their food by sucking juices from the plant, so that in hot weather especially, plants are likely to wilt. The adults prefer the young plants or growing tips on which to feed, and they collect on these in large numbers rather than on old plants or old leaves. On an old plant, all stages of the insect can be found. Adults do not feed readily on leaves on which are "red spiders" or plant lice.

MATING OF ADULTS

Adults of both sexes collect on the under surfaces of the leaves and remain there most of the time unless disturbed. Mating takes place freely when the adults are not confined too closely, but isolated pairs do not mate readily. Preliminary to copulation, a number of males frequently surround a female or there may be one at each side of her. The males are the active sex and stroke the head and antennae of the female with their antennae for some time, accompanying this activity with wing movements. One or more males may be seen performing these movements at the sides of a female. Presumably fertilized females were often observed to brush the males aside when the males came near them. In copulating, the female raises the abdomen and the male clasps her with his clasping organs from beneath. The copulating pair remain joined together on the average for about five minutes, but the time may be lengthened or shortened. Females were not observed to copulate more than once during the whole period of egg laying.

OBSERVATIONS ON EGG DEPOSITION

Place and Manner of Egg Deposition.—Very few eggs are placed upon the upper surfaces of the leaves, but overcrowding on the under surfaces no doubt tends to cause more deposition on other surfaces of plants. Counts of eggs distributed on different surfaces of plants in May, June and July, are given below:

May, 1914,	Upper surface of leaves	56
	Under surface of leaves	3594
	Stems	20
June, 1914,	Upper surface of leaves	131
	Under surface of leaves	7060
	Stems	28
July, 1914,	Upper surface of leaves	131
	Under surface of leaves	5280
	Stems	31

The eggs are deposited in an irregular manner on the surfaces of the leaves or in the form of circles and parts of circles. When depositing the eggs in the form of a circle, the female inserts her beak into the leaf tissue and using the beak as a pivot swings around and deposits the eggs one at a time. The time during which the female keeps the beak inserted in the leaf varies considerably. In cases observed, this lasted as long as 12 hours and without doubt is often prolonged. The largest number of eggs found in any circle was 29, and of 3670 eggs counted in May, 1914, 864 were arranged in circles or parts of circles and 2806 were scattered over the surface of the plant. The tendency to deposit eggs in circles is greater where the plant surfaces are smooth. The actual time taken to deposit the egg is short, the average being three seconds. The female depositing the egg bends the abdomen under the body and places the end firmly against the support and then on raising the abdomen leaves the egg fastened to the leaf. The space between eggs in circles is small.

Number of Eggs Deposited by a Single Female.—The females do not begin depositing eggs immediately after emerging from the pupa cases but feed for a few hours to one or more days. This is true for both the females that are fertilized and those that are not. The number of eggs deposited by nine fertilized females ranged from 28 to 121 and the number of eggs deposited by eight unfertilized females ranged from 46 to 91. The largest number of eggs deposited by one of these 17 females in a single day was nine, the daily average being 3 or 4. The individual egg-laying records follow:

Fertilized Females:

Fertilized 2/ 9/14, deposited 110 eggs, died 3/20/14.
Fertilized 2/10/14, deposited 80 eggs, died 3/18/14.
Fertilized 2/18/14, deposited 121 eggs, died 3/28/14.
Fertilized 2/28/14, deposited 74 eggs, died 4/ 1/14.
Fertilized 3/19/14, deposited 85 eggs, died 4/20/14.
Fertilized 4/10/14, deposited 71 eggs, died 5/14/14.
Fertilized 5/ 9/14, deposited 54 eggs, died 5/30/14.
Fertilized 6/18/14, deposited 28 eggs, died 6/29/14.
Fertilized 6/23/14, deposited 40 eggs, died 7/ 9/14.

Average 74

Unfertilized Females:

Emerged from pupa case 2/28/14, deposited 71 eggs, died 3/26/14.
Emerged from pupa case 3/21/14, deposited 91 eggs, died 4/24/14.
Emerged from pupa case 3/23/14, deposited 83 eggs, died 4/25/14.
Emerged from pupa case 4/ 7/17, deposited 87 eggs, died 5/ 6/14.
Emerged from pupa case 4/20/14, deposited 81 eggs, died 5/19/14.
Emerged from pupa case 4/23/14, deposited 96 eggs, died 5/19/14.
Emerged from pupa case 4/23/14, deposited 56 eggs, died 5/16/14.
Emerged from pupa case 5/ 9/14, deposited 46 eggs, died 5/31/14.

Average 76

HATCHING OF THE EGGS

When freshly laid, the egg is white or white with a yellowish-green cast. It begins to darken in two or three days and at the time of hatching is nearly black or dark brown. A number of eggs were discovered while the young were hatching from them. The first evidence of hatching is the rupturing of the case from the apex to the base. The young larva forces its way out of the case, ventral side to the slit. It first appears rather rounded in shape, but gradually flattens out as it crawls on to the leaf. The empty case collapses and bends over on itself. The egg stage lasts from 6 to 13 days, according to temperature conditions. Under prolonged low temperature, the maximum period may be slightly increased. Eggs on leaves that die do not hatch unless the egg period is nearly completed.

MOVEMENTS OF THE LARVAE

The newly hatched larvae do not fasten themselves permanently to the leaf immediately on hatching, but wander about on the leaf in an irregular path for some time. This migratory period usually ends after a few hours to a day. No instance was observed in which a larva crawled from one leaf to another, and this could hardly take place unless the leaves were in very close contact. The larva is easily turned aside by hairs or other obstacles. Larvae travel at the rate of about one to two mm. a minute, seldom more and even less. In one case observed, the larva required twenty minutes to travel 1 mm. The larva seldom gets farther away from the egg case than 10 to 15 mm. Very little activity was noted for the larvae after they became fastened permanently in the leaf. A slight turning on its axis, using the beak as a pivot, and a somewhat more pronounced movement of the caudal part of the body in the shedding of the skin, were the movements observed after the larva had secured itself to the leaf.

This motion of the caudal part of the body was simply an up and down movement. Voiding of excrement was evident in the viscid material collected in drops at the caudal end of the body. The larval skin breaks loose from the body near the anterior end and is gradually worked off over the abdomen by the aid of the up and down movements of the abdomen. It sometimes requires as much as 15 to 20 hours to accomplish this act, or even more. After the skin is removed, the body spreads out flat on the surface of the leaf. Sometimes when the skin is not completely removed, the body becomes constricted at that point.

EMERGENCE OF THE ADULT

The adult escapes thru a T-shaped opening on the dorsal side of the pupa case. This opening is made by a slit which begins at the anterior end of the case and extends thru the mid-dorsal region to the base of the abdomen where it joins a transverse slit which extends down the sides of the case. The time necessary for the young insect to escape is about 35 minutes, that is after the opening has been made. The newly escaped insect remains on the pupa case in a nearly perpendicular position until the appendages assume their natural shape and color and the wings expand into their normal form. Waxy secretions found on the older adults are not present at the time of emergence.

LENGTH OF LIFE OF THE ADULT

Adults live for a considerable length of time as indicated by those confined in breeding jars. Very few dead specimens can be found in the greenhouse in the colder months and but slightly more in the hot months. Breeding jar experiments indicate a longer life period by a few days in the colder months. The longest life period recorded was 46 days and in general the period lies within 30 to 40 days. Adults confined in jars without food do not live long. In April, 1914, on different days, 447 adults were confined in jars without food; they commenced to die at the end of 18 hours and were all dead at the end of 54 hours. Other observers record periods as long as three days.

PROPORTION OF MALES AND FEMALES

Unfertilized females readily deposit eggs and there is no appreciable difference in the number deposited by unfertilized and fertilized females. An unfertilized female's eggs produce all males, but a fertilized female's eggs do not produce all females. During March, April and May, 1914, eight unfertilized females deposited 611 eggs; these produced only males. C. B. Williams, 1917, in his paper, "Sex Ratios and Parthenogenesis" Jour. Genetics, Vol. VI, No. 4, p. 266, states in his summary:

"*Aleurodes vaporariorum* has two races, one of which, found in England, produces females parthenogenetically; the other, found in the United States, produces males. A colony of what is apparently the male-producing race has been found in England."

Records of the progeny of fertilized females show that nearly 40 per cent are males and 60 per cent females; a record of 170 individuals reared shows 105 females and 65 males. During May, 1914, 818 adults were collected from plants in the greenhouse; of these, 549 were females and 270 males. However, in March, 1914, the proportions were reversed; out of 362 adults collected, 212 were males and 150 were females.

LENGTH OF A BROOD AND OF THE LARVAL AND PUPAL PERIODS

The time necessary to complete all the stages of the brood varies considerably according to the season. In winter more time is necessary to complete a brood than in summer; in fact, the shortening of the brood in summer is quite appreciable. The average length of a brood, determined from 174 rearings, is 31.87 days. The time necessary to complete a brood varies from 21 to 41 days. By allowing a few days for fertilization of the females, this would give a generation in a little more than five weeks thru the year.

Larval Periods.—The larva of the white fly moults three times before entering upon the pupal stage. These stages may be lengthened or shortened by temperature conditions. In the summary of rearings of 174 individuals in table 4, the first larval instar averages 4.74 days, the second 4.26 days, the third 4.14 days; the first varies from 2 to 8 days, the second varies from 2 to 8 days, and the third varies from 2 to 6 days.

Pupal Period.—The pupal period spoken of here is the stage from the third moult of the larva to the emergence of the adult, but during the first part of this period the growth is still continuing and this, therefore, should be called the fourth larval period. However, there is no fourth shedding of the skin. The pupal period, as noted in summary of rearings, table 4, averages 9.15 days, with variations from 6 to 13 days. No doubt the maximum period would be increased under prolonged lower temperatures. These averages were made from rearings in February, March, April, May, June and July of 1914.

RECORD OF REARINGS. 1914

TABLE 1. Nine Females that had Copulated

	Incubation Period of Egg	Larval Instars			Pupal Instar	Length of Brood	Number Reared	Sex
		1	2	3				
	days	days	days	days	days	days		
Average	9.42	4.82	4.24	4.13	9.13	31.74	61	Females
Range	6-13	2-8	2-8	2-6	6-13	21-41		
Average	8.39	4.31	3.91	4.13	9.05	29.79	38	Males
Range	6-12	2-8	2-8	3-6	7-13	21-40		

TABLE 2. Six Females that had not Copulated

	Incubation Period of Egg	Larval Instars			Pupal Instar	Length of Brood	Number Reared	Sex
		1	2	3				
	days	days	days	days	days	days		
Average	10.29	4.85	4.32	4.05	9.14	32.65	55	Males
Range	9-12	3-7	3-6	3-5	7-11	29-36		

TABLE 3. One Female that had Copulated

	Incubation Period of Egg	Larval Instars			Pupal Instar	Length of Brood	Number Reared	Sex
		1	2	3				
	days	days	days	days	days	days		
Average	10.15	5.00	4.60	4.25	9.30	33.30	20	Males
Range	10-12	3-6	3-6	4-5	8-12	31-36		

TABLE 4. Summary

	Incubation Period of Egg	Larval Instars			Pupal Instar	Length of Brood	Number Reared	Sex
		1	2	3				
	days	days	days	days	days	days		
Average	9.56	4.74	4.26	4.14	9.15	31.87	174	Females & Males
Range	6-13	2-8	2-8	2-6	6-13	21-41		

Explanation of Tables of Rearings

Table 1. The rearings presented in this table were made from eggs deposited in February, March, April, May, June and July by 9 females that had copulated.

Table 2. The rearings presented in this table were made from eggs deposited in March, April and May by 6 females that had not copulated. These females were taken as they emerged from the pupa cases and were then isolated in breeding jars.

Table 3. The rearings presented in this table were made from eggs deposited March 2-8, by a female that had copulated, but because the progeny were all males the records were kept separate.

Table 4. This table presents a summary of the rearings of tables 1, 2 and 3.

THE STAGES OF THE INSECT

The Egg.—The egg is ovoid in shape, somewhat elongated, pointed at the apex and slightly flattened or concave on the side. It is small and not readily noticed without the aid of a lense. It varies from .2 to .5 mm. in length and has a diameter slightly less than .1 mm. at the thickest part. The surface is smooth and has no markings. It is white with a yellowish-green cast when freshly laid. Each egg is fastened to the leaf with a small, slender stem, which extends from the base of the egg.

The Larva.—The larva moults three times and with each moult there is an increase in size. The color is light green. In the first instar, the larva is nearly oval in outline with the abdomen slightly tapering. A pair of eyes, the antennae, the mouth parts, the legs and the segmentation are readily observed on the ventral side; a pair of eyes, the vasiform orifice and the segmentation are readily observed on the dorsal side. The dorsal segmentation is more pronounced in the abdominal region. In the second and third instars, the body is more elliptical than in the first stage and the antennae and legs are more nearly atrophied; otherwise, there are no very marked differences except in size. The average length of the larvae at the end of the first instar is .285 mm.; at the end of the second instar, .375 mm., and at the end of the third instar, .519 mm.

The Pupa.—The pupa is yellowish-green in color and is oval to elliptical in outline. The empty case is white, and it remains attached to the leaf for a long time. The pupa is slightly convex, thicker than the larva and averages .75 mm. long by slightly less and .5 mm. wide. The dorsum bears a number of glass-like rods or waxen secretions of two sizes. The short, rather blunt rods are submarginal, with their bases nearly in alignment, and in general they curve down over the margin. The larger and longer rods usually are arranged in seven pairs, tho the number may vary, as is the case with the shorter rods. The longer rods are arranged within the shorter rods on the dorsum; one pair close to the cephalic margin, one pair a short distance back of the first on the cephalic region, a pair on the thoracic region, two pairs on the abdominal region, a pair on the caudal margin and a pair on the caudo-lateral margin. This arrangement of rods is an aid in determining this species of *Asterochiton.* The eyes appear as reddish spots in mature pupae.

The Adult.—The adult white flies are small, four-winged insects provided with sucking mouth-parts. The wings and body become covered with a powdery waxen secretion soon after the adults emerge from the pupa cases. The male is smaller than the female, with the abdomen more pointed. Each wing has a single median vein with a slight branch at the base of the vein in the fore wing. The fore wings are larger than the hind wings. The body, legs and antennae are yellowish, wings white, the tip of the beak black, and the eyes reddish or reddish-brown. The average length of the female from the anterior end to the end of the wing is 1.48 mm., the average wing expanse, 2.48 mm.

PARASITES OF THE WHITE FLY

Encarsia pergandiella.—During the four years covered by these observations, parasites have not been present at any time in sufficient numbers to aid materially in controlling the white fly. A Hymenopterous parasite was collected in November, 1914, which was determined as being *Encarsia pergandiella.* This parasite disappeared after about six weeks. About four per cent of the pupae were parasited at that time. The parasite deposits its eggs in both the pupae and larvae, and it is very active in hunting the immature stages in which to deposit its eggs. Two females, on November 24, 1914, a. m., were observed to thrust their ovipositors into ten different larvae and pupae. These larvae and pupae were isolated and on December 3, 1914, a. m., seven adult parasites emerged from the cases.

Fungus.—The viscid nature of the excrement of the larvae together with warm, damp weather encourages fungus growths. Frequently, a dark, sooty fungus makes its appearance among the larvae and pupae and many of them are killed by it. This fungus no doubt at times does some good, but it is likely to interfere with the respiration of the leaves of the plant and cause them to die. The fungus was not identified.

REMEDIES

A number of experiments were made at the Station Insectary during the time the study of the white fly was in progress, in an attempt to find an effective remedy; both fumigants and contact insecticides were used. Potted tomato plants were used in all the experiments. A statement of methods, experimental data, discussion, and recommendations follows:

FUMIGANTS

Potassium Cyanide.—Potassium cyanide was used in the first test of hydrocyanic acid gas as a fumigant. The cyanide was 98 per cent pure and was "fumigation cyanide." The old formula: 1 part cyanide, 1 part acid and 4 parts water, was used. The sulfuric acid was a good grade of commercial acid.

The cyanide was first carefully weiged out, and the water and acid measured, then the acid was poured into the water in a small crock. The plants were then placed in the fumigation box, and the cyanide was put into the diluted acid and the box door closed. The foliage of the plants was dry when fumigated and the earth in the pots free from excess moisture. The weights of the cyanide used in these experiments varied from 5 to 10 milligrams per cubic foot of content of the box. Duration of exposure was three hours, 15 hours and 15.5 hours. When the fumigation was completed, the plants were removed from the fumigation box and were kept isolated in one part of the Insectary until the results of the fumigation were recorded. The fumigation box has a capacity of 50 cubic feet and was practically air-tight.

Sodium Cyanide.—Sodium cyanide was used in a few tests of hydrocyanic acid gas as a fumigant. The cyanide was designated as 129 per cent, with 51 per cent cyanogen, and was a brand used for fumigation. The sodium cyanide was used according to the following formula: 1 part sodium cyanide 1½ parts of a good grade commercial sulfuric acid and 2 parts water. In the experiments with sodium cyanide, 5.4, 6.2 and 6.9 milligrams of the cyanide were used per cubic foot. The general plan of these experiments was the same as that for potassium cyanide. The fumigation box had a capacity of 25 cubic feet.

Para-dichlorobenzene.—Para-dichlorobenzene was used alone as a fumigant and in combination with other chemicals. In preparation for fumigation, the para-dichlorobenzene was crushed into particles about the size of coarse salt. When used alone, it was spread evenly over the bottom of a shallow glass dish of about 12 inches in diameter and in this condition was placed in the fumigation box. Four and six ounces of the fumigant to a box of 25 cubic feet capacity were used in the experiments, the test lasting fifteen hours. After the fumigation the plants were isolated and the results of the fumigation recorded. All tests of para-dichlorobenzene and combinations with it were made in a box of 25 cubic feet capacity.

Para-dichlorobenzene and Acetone.—Two ounces of para-dichlorobenzene were put into two ounces of acetone and the combination was emptied into a flat dish in the fumigation box. The plants were then placed in the box and the tests were continued for 2, 4, 8 and 12 hours respectively. At the end of the tests the plants were isolated as in the other experiments.

Para-dichlorobenzene and Carbon Tetrachlorid.—Two ounces of para-dichlorobenzene were put into a dish containing two ounces of carbon tetrachlorid and the combination was placed in the fumigation box. The plants were fumigated for 2, 4, 8 and 12 hours respectively. They were then removed from the fumigation box, and the effects of the fumigation recorded.

CONTACT SPRAYS

Kerosene Emulsion.—The kerosene emulsion was made according to the standard formula: kerosene 2 gallons, whale-oil soap ½ pound and water 1 gallon. The spray was made by mixing one part of the emulsion with 11, 12, 13, 14 and 15 parts of water, respectively. The plant to be sprayed was placed on a large sheet of paper and after the spraying such adults as remained fastened to the paper were counted and the number added to the number of dead adults on the plant. The adults alive on the plant after the spray had dried were collected and counted and an estimate of the adults killed was found. The plant was kept isolated until all the data had been recorded.

Whale-oil Soap.—Whale-oil soap spray was made by dissolving 1 ounce of the soap in 1 gallon of water or 1.5 or 2 ounces to each gallon for the stronger sprays. The spraying and subsequent treatment of the plants was the same as for the kerosene emulsion spray.

Schnarr's Insecticide.—A spray was made of this emulsion by using 1 part of the emulsion to 30, 40, 50 and 60 parts of water, respectively. The spraying was conducted in the same manner as that for the kerosene emulsion. The plants were kept isolated until all observations had been recorded.

TABLE 5. Potassium Cyanide, 1-2-4 formula. 1914-1915

No. of Experiments	Temperature F. Degrees	Duration of Test, Hours	Wt. of Cyanide per cu. ft. milligrams	Effect on Plants	Per Cent Dead at End of Test, Average				Range in Per Cent of Adults Dead
					Eggs	Larvae	Pupae	Adults	
3	67-68	3	5	no injury	1.4	34.7	23.8	92.8	85-98
checks	do.	do.	0	do.	1.7	4.5	6.3	none	
1	54.5	15.5	5	do.	0.8	38.1	28.9	89.5	
check	do.	do.	0	do.	0.5	3.6	5.8	none	
3	68-69.8	3	6	do.	1.7	33.2	41.4	95.8	90-100
checks	do.	do.	0	do.	1.3	4.9	7.6	none	
1	68	15	6	do.	1.4	47.7	40.1	98.8	
check	do.	do.	0	do.	1.9	4.5	7.6	none	
3	64.5-72	3	7	do.	1.8	70.7	47.8	99.3	98-100
checks	do.	do.	0	do.	1.1	3.5	6.8	none	
1	66	15	7	do.	1.6	68.9	43.5	100	
check	do.	do.	0	do.	1.7	4.8	6.8	none	
2	59	3	8	do.	1.1	78.3	45.2	99.5	99-100
checks	do.	do.	0	do.	1.2	4.3	8.3	none	
2	57-69.8	15	8	do.	1.9	86.2	37.3	100	
checks	do	do.	0	do.	1.7	5.7	7.4	none	
3	64.5-68	3	9	do.	3.1	88.9	70.8	100	
checks	do.	do.	0	do.	1.5	3.8	7.4	none	
1	57	15.5	9	do.	4.2	91.0	71.1	100	
check	do.	do.	0	do.	0.6	5.2	6.5	none	
3	59-68	3	10	slight injury	2.5	91.2	82.0	100	
checks	do.	do.	0	no injury	1.2	4.9	8.8	none	
2	59-62.5	15	10	slight injury	1.8	94.0	65.5	100	
checks	do.	do.	0	no injury	1.9	5.8	9.3	none	

TABLE 6. Sodium Cyanide. 1919-1920

No. of Experiments	Temperature F. Degrees	Duration of Test, Hours	Wt. of Cyanide Per Cu. Ft. Milligrams	Effect on Plants	Per Cent Dead at End of Test, Average		
					Larvae	Pupae	Adults
1	64.5	3	5.4	no injury	65	45	100
4	50-80	15	do.	do.	68	39.5	100
checks	do.	do.	0	do.	3.4	5.8	none
6	51-75	15	6.2	slight injury	82.1	51.5	100
checks	do.	do.	0	no injury	3.8	7.5	none
2	50-68	3	6.9	moderate injury	84	67.5	100
2	60-66	15	do.	slight injury	90	75	100
check	do.	do.	0	no injury	5.5	10.5	none

TABLE 7. Para-dichlorobenzene. 1919

No. of Experiments	Temperature F. Degrees	Duration of Test, Hours	Wt. of Para-dichlorobenzene Per 25 Cu. Ft. Ounces	Effect on Plants	Per Cent Dead at End of Test		
					Larvae	Pupae	Adults
1	70	15	4	no injury	77.3	40.1	100
check	do.	do.	0	do.	2.4	4.3	none
1	75	15	6	leaves injured	91.3	75.0	100
check	do.	do.	0	no injury	2.4	4.3	none

TABLE 8. Para-dichlorobenzene and Acetone. 1919

No. of Experiments	Temperature F. Degrees	Duration of Test, Hours	Amount of Each used, Ounces	Effect on Plants	Per Cent Dead at End of Test		
					Larvae	Pupae	Adults
1	77	2	2	no injury	1.8	3.6	00
1	do.	4	do.	do.	30.2	14.3	100
1	do.	8	do.	do.	64.5	18.0	100
1	do.	12	do.	tips of leaves killed	66.3	20.2	100
check	do.	do.	0	no injury	2.3	6.5	none

TABLE 9. Para-dichlorobenzene and Carbon Tetrachloride. 1919

No. of Experiments	Temperature F. Degrees	Duration of Test, Hours	Amount of Each used, Ounces	Effect on Plants	Per Cent Dead at End of Test, Average		
					Larvae	Pupae	Adults
2	74-79.7	2	2	no injury	0.9	3.0	00
2	do.	4	do.	do.	5.3	2.9	100
2	do.	8	do.	considerable injury	8.9	3.4	100
2	do.	12	do.	do.	26.9	6.5	100
checks	do.	do.	0	no injury	1.7	2.7	none

TABLE 10. Kerosene Emulsion. 1915

No. of Experiments	Temperature F. Degrees	Dilution	Effect on Plants	Per Cent Dead at End of Test, Average				Range in Per Cent of Adults Dead
				Eggs	Larvae	Pupae	Adults	
5	69.8	1-11	leaves spotted, slightly burned	1.6	82.5	48.7	73	65-80
checks	do.	0	no injury	1.5	5.6	8.9	none	
4	77	1-12	leaves spotted, slightly burned	1.6	74.9	48.0	63.7	55-70
checks	do.	0	no injury	1.6	3.5	9.6	none	
5	87	1-13	leaves spotted and burned	1.4	63.4	44.8	69	65-75
checks	do.	0	no injury	1.8	4.8	8.5	none	
5	87	1-14	leaves spotted and burned	1.6	67.6	42.7	67	60-75
checks	do.	0	no injury	1.1	6.8	9.4	none	
5	86	1-15	very slight injury	1.5	45.9	28.0	64	60-70
checks	do.	0	no injury	1.6	3.9	8.3	none	

TABLE II. Scharr's Insecticide. 1915

No. of Experiments	Temperature F. Degrees	Dilution	Effect on Plants	Per Cent Dead at End of Test, Average				Range in Per Cent of Adults Dead
				Eggs	Larvae	Pupae	Adults	
2	72	1-60	no injury	2.7	77.9	60.4	72.5	70-75
checks	do.	0	do.	1.5	3.9	7.4	none	
2	61-66	1-50	no injury	2.9	87.5	25.9	72.5	70-75
checks	do.	0	do.	1.8	5.4	7.1	none	
3	77-82.5	1-40	slight injury	2.5	83.3	42.2	66.6	55-70
checks	do.	0	no injury	2.1	5.5	7.1	none	
2	92	1-30	severe injury	6.4	94.0	50.0	75	
checks	do.	0	no injury	1.6	5.3	8.1	none	

TABLE 12. Whale-Oil Soap. 1915

No. of Experiments	Temperature F. Degrees	Wt. of Soap to 1 Gal. Water, Ounces	Effect on Plants	Per Cent Dead at End of Test, Average				Range in Per Cent of Adults Dead
				Eggs	Larvae	Pupae	Adults	
5	75	1	no injury	1.9	75.5	38.8	70	60-80
checks	do.	0	do.	1.9	4.4	6.8	none	
5	64	1.5	no injury	1.7	85.7	44.4	71	65-75
checks	do.	0	do.	1.8	5.4	8.7	none	
5	68.5	2	no injury	1.1	89.2	60.5	71	65-75
checks	do.	0	do.	1.6	5.3	9.0	none	

DISCUSSION OF THE EXPERIMENTAL DATA

Table 5.—It will be seen from this table that no injury resulted to the plants when from 5 to 9 milligrams of the cyanide per cubic foot were used at 3 and 15.5 hours' exposure; but, that slight injury did result from the use of 10 milligrams of cyanide per cubic foot at 3 and 15 hours' exposure. The fumigation had practically no effect upon the viability of the eggs in any test. Five milligrams of the cyanide per cubic foot killed a good per cent of the adults but had little effect upon the larvae and pupae. When 9 milligrams of the cyanide per cubic foot were used, a moderate per cent of both larvae and pupae were killed; the 3-hour exposure was very nearly as effective as the 15.5-hour exposure.

Table 6.—This table gives the results of a few experiments with sodium cyanide. There was no injury to the plants when 5.4 milligrams of cyanide per cubic foot were used. Only a moderate per cent of the larvae and pupae were killed. With 6.2 milligrams of the cyanide per cubic foot at 15 hours' exposure, there was very slight injury to the plants, but the plants were young and tender. When 6.9 milligrams of cyanide per cubic foot were used, there was some injury to the tips and edges of the leaves.

Table 7.—Two tests of para-dichlorobenzene as a fumigant were made, each test lasting 15 hours. When four ounces of para-dichlorobenzene to 25 cubic feet were used, the plant was not injured, but when six ounces were used the leaves of the plant were injured. Fumigation with four ounces of the fumigant killed a good many of both larvae and pupae and all the adults. The eggs were not injured.

Table 8.—Four tests were made with para-dichlorobenzene and acetone, using two ounces of each in combination. The adults were killed at four or more hours' exposure, but larvae and pupae were not greatly affected. Twelve hour exposures killed the tips of the leaves of the plants.

Table 9.—Para-dichlorobenzene and carbon tetrachlorid in a combination of two ounces each was not a satisfactory fumigant. The adults were killed at four hours or more exposure, but the larvae and pupae were scarcely affected. The plants were injured at 8 hours' exposure.

Table 10.—Several tests were made of dilutions of kerosene emulsion. All the tests recorded in the table show that the leaves of the plants were injured. The spray did not affect the eggs in any test. Dilutions of 1 part of the emulsion to 11 or 12 of water kill a good per cent of the larvae, but kill a too small per cent of the pupae.

Table 11.—Schnarr's Insecticide at dilutions of 1 part of the emulsion to 50 or 60 parts of water did not injure the plants and show a fair control of both larvae and pupae. The eggs were very slightly affected, if at all, by these dilutions.

Table 12.—Whale-oil soap did not injure the plants in any of the tests that were made. The eggs were not affected by the spray, and only such adults as were hit by the spray were killed. Seventy-five to eighty-nine per cent of the larvae and 38 to 60 per cent of the pupae were killed by the spray.

TESTS OF OTHER INSECTICIDES

Tobacco Extracts.—"Black-leaf-40" and "Nico-fume" are not satisfactory remedies for the white fly. Sprays made from these extracts were not as effective as plain soap solutions. The "Nico-fume" used as a fumigant at the rate of 3 ounces to 1,000 cubic feet killed from 96 to 100 per cent of the adults, but the immature stages of the insect were only slightly affected.

Soluble Sulfur.—Sprays made of soluble sulfur were not effective remedies when used at strength of one pound of the soluble sulfur to 45 or 50 gallons of water. Some of the plants were injured in each test.

Lime-sulfur Solution.—This solution was not an effective remedy for the fly. When used in proportion of 1 to 30 or greater, injury resulted to the plants.

RECOMMENDATIONS

Hydrocyanic acid gas is a satisfactory fumigant for freeing hothouses of the white fly. The eggs of this insect are not affected greatly by fumigations at strengths that do not injure the plants, so that it is necessary to repeat the fumigation in about 10 days; two or three fumigations should rid the hothouse entirely of this pest. In an air-tight box, 8 or 9 milligrams of potassium cyanide per cubit foot did not injure tomato plants at 15 hours' exposure. The sodium cyanide should be used in amounts a third less than those recommended for potassium cyanide. Sodium cyanide has very largely replaced potassium cyanide as a fumigant. Slightly larger amounts of cyanide can be used in a hothouse because it is not air-tight, but it must be remembered that different plants are not all affected alike by hydrocyanic acid gas. A preliminary test or two in a hothouse will help in determining the proper amount of cyanide to use.

It is not always practicable to fumigate with hydrocyanic acid gas, and in such cases frequent sprayings with soap solutions, made by dissolving one or two ounces of soap in a gallon of water, will do much to keep this insect under control.

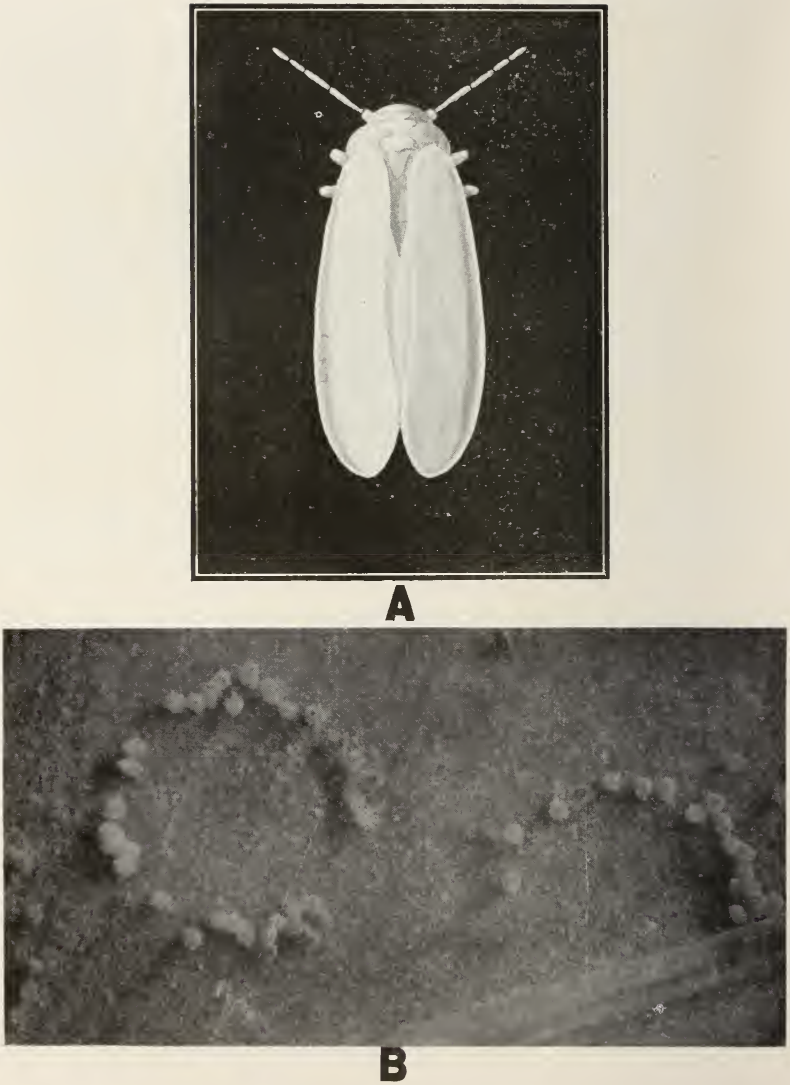

Fig. 1. A, the adult hothouse white fly (*Asterochiton vaporariorum*) greatly magnified. B, showing the manner of placing the eggs on leaves.

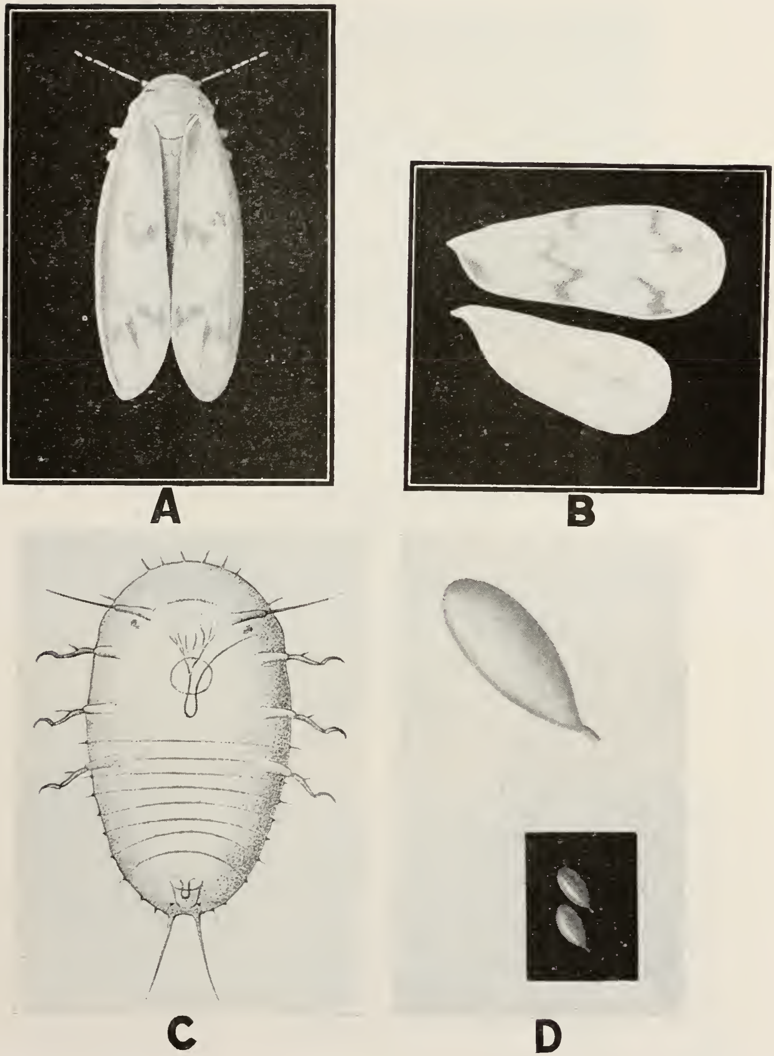

Fig. 2. A, the banded-winged hothouse white fly (*Asterochiton abutilonea*) greatly magnified. B, surface views of front and hind wings. C, the young recently hatched. D, the eggs, one above more highly magnified.

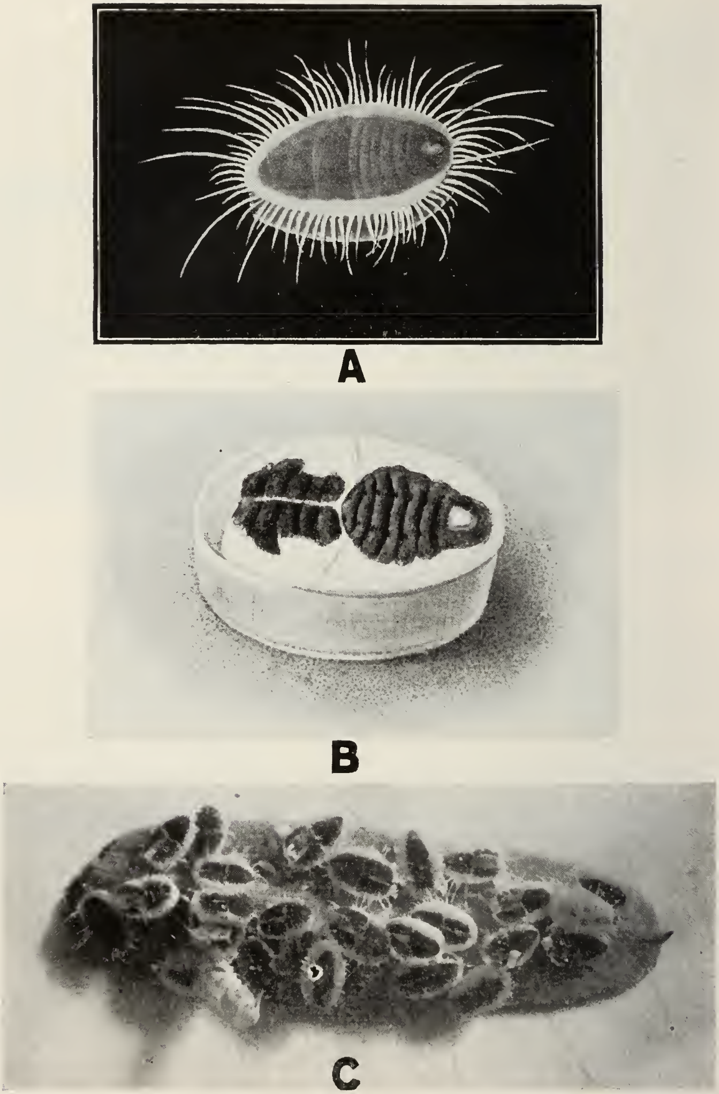

Fig. 3. A, the young of *A. abutilonea*, showing marginal setae. B, the pupa case after the adult has emerged. C, showing young thickly crowded on leaflet of *Sesbania macrocarpa*. All highly magnified.

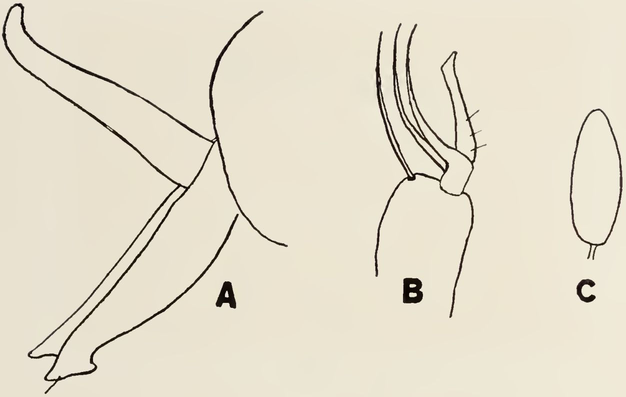

Fig. 4. A, abdominal appendages of the male *A. vaporariorum.* B, the tarsal claw of the same. C, the egg of same. Highly magnified.

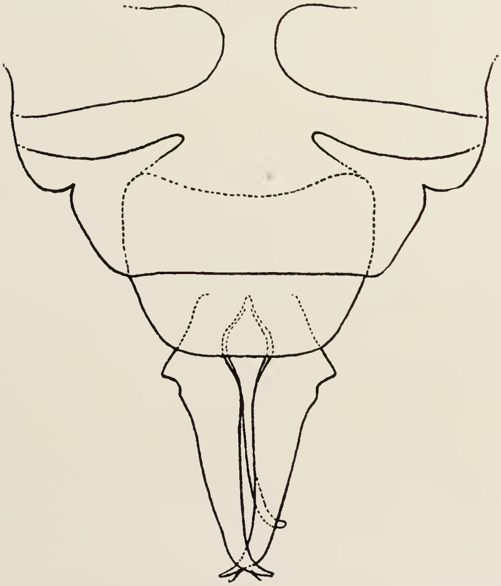

Fig. 5. The abdominal appendages of the male *A. abutilonca* seen from beneath. Highly magnified.

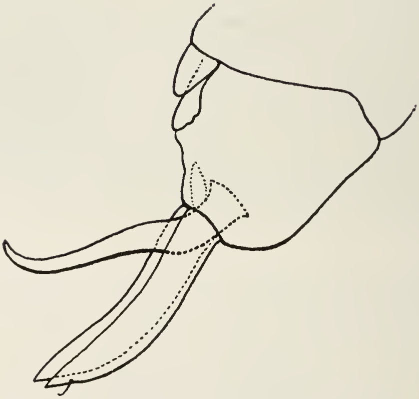

Fig. 6. The abdominal appendages of the male *A. abutilonea* seen from the side. Highly magnified.

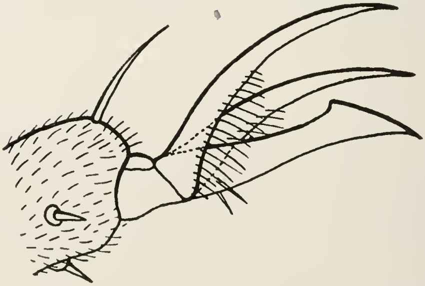

Fig. 7. The tarsal claws of *A. abutilonea*. Highly magnified.

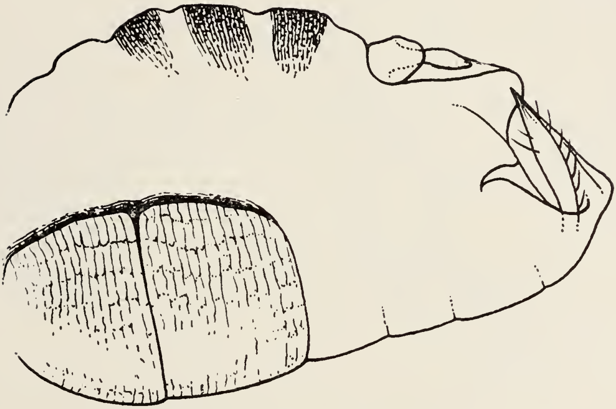

Fig. 8. The abdomen of the female *A. abutilonea*, showing the extensive glands on two of the basal segments. Seen from the side. Highly magnified.

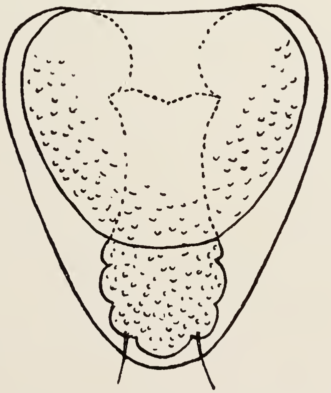

Fig. 9. The operculum and associated structures of the young *A. vaporariorum*. Highly magnified.

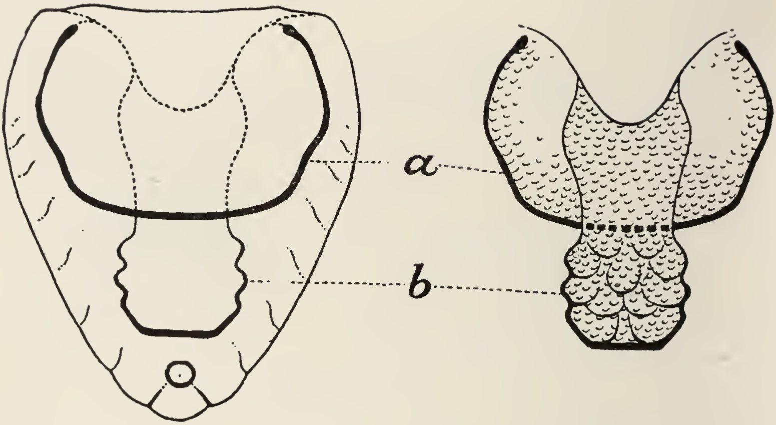

Fig. 10. The operculum and associated structures of the young *A. abutilonea.* Highly magnified.

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B

Kentucky
Agricultural Experiment Station
University of Kentucky

Feeding Steers Having Access to Barn and Range
vs.
Steers Confined to Barn

BULLETIN NO. 242

Lexington, Ky.

June, 1922

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BULLETIN NO. 242

Feeding Steers Having Access to Barn and Range
vs.
Steers Confined to Barn

By
E. S. GOOD

INTRODUCTION

It is well understood that one of the main factors to be considered in the feeding of steers is the fertilizer produced in the form of manure. It is estimated that about 85 per cent of the fertilizing constituents of a feed stuff are recovered in the solid and liquid manure. If the steer is allowed range, a considerable part of the fertilizing constituents may be lost by rains washing the manure into streams or by its being tramped into mud. This is especially true if the steer is confined in a small open lot. If steers are allowed the run of one certain pasture, this field becomes very fertile to the detriment of other fields on the farm. Even in the field where such cattle run, a part of the manure is deposited where not needed, such as in valleys and fence corners.

Manure is of great value in adding humus and fertility to the soil and communities that have paid special attention to its production and conservation have become outstanding ones as to richness of soil and farm wealth. A good illustration of this is Lancaster County, Pennsylvania, where some sixty thousand steers are fed annually and nearly all confined under cover. This county ranks among the very first in the United States in agricultural wealth and prosperity. It is one of the large tobacco-producing counties in the United States producing as much as forty million pounds in some years. Sections of the county are also extensively engaged in truck gardening.

A number of feeders of steers in the western part of Kentucky, especially in Warren County, have for the past fifteen years been confining their steers under cover while fattening them for market. The main purpose of this procedure was to save as much of the manure as possible and to conserve its fertilizing constituents by protecting it from the rains. Then, too, the thoro tramping of the manure by the steers made it very compact and thus put it into a state where little fermentation took place, under which conditions it did not need to be hauled at once to the fields but could be moved during the slack season of work. The farms where such a system was followed always were found to be fertile. The fertility of depleted farms, also, was built up by this procedure, resulting in an increase in production of crops as well as of value per acre from year to year.

It was thought by some feeders, however, that although more manure would be conserved by confining steers under cover, the gains on steers would not be as large, when they were confined, as would be the case if the steers were allowed range, especially range with pasture, in addition to the run of the barn. It was to obtain experimental data along this line as well as to compare the amount of manure produced by the two systems of handling steers that the following experiments, the results of which are recorded in this bulletin, were planned and conducted.

PLAN

For the purpose of conducting the experiments as outlined in this bulletin, a barn 32 x 50 feet was built, having at one end a covered barnyard 25 feet in depth. This barnyard was covered with a shed-like roof and the sides were fenced in. This construction admitted a great deal of sunlight and air. (See cut, p. 135) Two feed mangers running thru the center of the barn were connected with an 18-inch feed alley, the bottoms of the mangers being 30 inches and the tops 43 inches above the ground floor. This height eliminated the necessity of raising the mangers as the manure accumulated and also prevented the hogs running after the steers from getting into the mangers. As steers could not eat conveniently from this trough when there was no manure in the barn, logs were placed before the mangers so that the steers could raise themselves by putting their front feet on them while eating. Racks for hay and straw were situated on the sides of the barn. Fresh water was supplied in a concrete tank inside the barn. The water was pumped to this tank from a spring by means of a small gasoline engine. The barn and covered barnyard were kept well bedded with wheat straw.

Steers should not be crowded if confined to a barn. They should have at least 60 square feet of floor space per steer.

In this investigation three consecutive experiments were conducted. The first was run November 15, 1915 to April 24, 1916 (161 days); the second from November 27, 1916 to April 23, 1917 (147 days); and the third from November 15, 1917 to April 4, 1918 (140 days). In each of these experiments, twenty steers were divided into two lots of ten each, numbered Lot 5 and Lot 6, these lots being as nearly alike as possible in size, condition, quality and breeding. Also, in each experiment, the two lots received the same feeds and were otherwise handled the same, except that Lot 6 was kept confined to one-half of the barn and covered yard and Lot 5 allowed the run of the other half of the barn and a twenty-acre bluegrass pasture.

DESCRIPTION OF THE STEERS

The steers in these trials were selected from a large number of native steers which had been purchased by a dealer during the late summer and early fall months and run on a bluegrass pasture on his farm located about six miles from the Experiment Station. They were mostly grade Shorthorns with a few Hereford and Angus grades. They were selected as to uniformity of weight, age, quality, condition and thrift. Two-year-old steers were used.

METHOD OF VALUING THE CATTLE

The initial value of the cattle was based upon the purchase price, which was about the average price paid for feeder cattle in this State at the time of purchase. At the end of the feeding period, the cattle were valued by a committee of experts.

WEIGHTS

Before the experiment was begun, a sufficient length of time was allowed the steers to regain shrinks caused by driving them from the place of purchase to the Experiment Station feed lots. Each steer in the experiment was identified by a numbered brass tag on a strap fastened around the neck.

Each animal was weighed in the morning of three consecutive days at the beginning and end of the experiment. The averages of the three weights at the beginning and end of the feeding period were taken as the initial and final weights, respectively. It was our aim to weigh each lot as a group every two weeks and individually every thirty days, weather permitting. As the steers had to be driven one-half mile to be weighed, it was not practicable to do this at the end of certain periods on account of stormy weather. The steers were not allowed the morning feed and water was kept from them for twelve hours before weighing.

METHOD OF FEEDING

The steers were fed twice a day, at 7 a. m. and 4 p. m. The cottonseed meal was spread on and mixed with the silage, as was the corn when fed. The straw was fed in racks. Salt was kept before the cattle at all times.

FEEDS USED

Rations fed in these trials consisted of various combinations of the following feeds: Corn, cottonseed meal, wheat straw, oat straw, bluegrass chaff, corn stover and soybean straw. The same combination of feeds was not used in any two experiments, but the same with both lots in each year's experiment. Corn stover was fed only the first few days of the experiment, until the cattle gained a fill and could be placed on full feed. Feeds used each year are given below:

First Experiment (November 15, 1915-April 24, 1916): Cottonseed meal, broken ear corn, shelled corn, sorghum silage, corn stover and oat straw.

Second Experiment (November 27, 1916-April 23, 1917): Cottonseed meal, sorghum silage, wheat straw and bluegrass chaff.

Third Experiment (November 15, 1917-April 4, 1918): Cottonseed meal, sorghum silage, corn silage, wheat straw, soybean straw and corn the last ninety days.

METHOD OF STARTING THESE CATTLE ON FEED

The cattle were given a preliminary feed of cottonseed meal, corn silage, corn stover and straw for several days before starting on the experiments. This was done in order to regain the shrink and get the cattle accustomed to the feeds used in the experiments.

When the experiments started, the steers were given one-half pound of cottonseed meal, 20 pounds silage, 6 pounds hay and about all the straw and stover they would eat. When corn was fed in the experiments, the steers were started on 2½ pounds per day and gradually increased so that when they were marketed they were getting nearly a full feed. Silage was increased to a full feed by the end of the first week, and cottonseed meal was increased to a full feed by the end of the first thirty days.

HOGS

Hogs followed the cattle in the two experiments when corn was fed. The first year two 95-pound pigs were allowed to run with each lot of cattle. A sufficient amount of tankage to balance the ration was fed these hogs.

The third year two 200-pound pigs were allowed to follow each lot of steers. No tankage was fed during this year and the pigs received only the droppings from the cattle.

FIRST EXPERIMENT IN FEEDING STEERS HAVING ACCESS TO BARN AND RANGE VS. STEERS CONFINED TO BARN

The tables given show comparative data on the amount of feed eaten, the rapidity and cost of gains, the finish on cattle, the profit, and the manure saved by steers confined in a barn with a covered barnyard as compared with steers allowed the run of a barn and the range of a twenty-acre bluegrass pasture.

TABLE I. Average Amount of Feed Consumed Daily Per Head by Periods.

November 15, 1915-April 24, 1916 (161 days)

RATION	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
First Period (31 days)		
Cottonseed meal	1.40 lbs.	1.40 lbs.
Shelled corn	7.45 "	7.45 "
Sorghum silage	25.40 "	30.32 "
Corn stover	8.26 "	8.26 "
Oat straw	1.61 "	1.93 "
Second Period (31 days)		
Cottonseed meal	3.41 "	3.39 "
Shelled corn	9.90 "	9.90 "
Sorghum silage	39.67 "	45.48 "
Oat straw	3.80 "	2.93 "
Third Period (31 days)		
Cottonseed meal	3.50 "	3.50 "
Shelled corn	10.00 "	10.00 "
Sorghum silage	40.00 "	44.56 "
Oat straw	5.48 "	3.13 "
Fourth Period (29 days)		
Cottonseed meal	3.52 "	3.52 "
Shelled corn	10.93 "	10.93 "
Sorghum silage	36.24 "	43.82 "
Oat straw	3.60 "	3.33 "
Fifth Period (39 days)		
Cottonseed meal	3.78 "	3.78 "
Shelled corn	17.82 "	17.82 "
Sorghum silage	30.07 "	30.07 "
Oat straw	.87 "	1.18 "

It will be noted that the amounts of corn and cottonseed meal consumed were almost exactly the same in the two lots during the five feeding periods. The steers in Lot 6 consumed considerably more silage in every period except the last, but they ate less straw, especially in the second and third periods. The steers in Lot 5 had their appetite for succulent feed partly satisfied by the pasture, which accounts for the smaller amount of silage eaten by them.

Corn stover was fed during the first period while the steers were becoming accustomed to cottonseed meal and silage.

TABLE II. Average Daily Gain Per Steer by Periods.
November 15, 1915-April 24, 1916.

	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
First Period (31 days)	2.45 lbs.	3.45 lbs.
Second Period (31 days)	1.80 "	1.48 "
Third Period (31 days)	.16 "	.83 "
Fourth Period (29 days)	2.18 "	2.10 "
Fifth Period (39 days)	2.40 "	2.41 "
Total gain per steer	294.00 "	334.00 "
Average daily gain for entire period	1.82 "	2.07 "

Table II shows that good gains were made by both lots during the first, fourth, and fifth periods, but that poor gains were made in both lots during the second and third periods. The greatest differences in gains in the two lots were in the first period, in which Lot 6 made one pound more gain per day per steer than did Lot 5, and in the third period, in which Lot 6 gained .67 pounds more than Lot 5. The total gain per steer was 294 pounds for Lot 5 and 334 pounds for Lot 6, which is a difference of 40 pounds per steer in favor of the steers which were confined.

The average daily gain for the whole time for each steer was 1.82 pounds for Lot 5 and 2.07 pounds for Lot 6—a difference of .25 of a pound in favor of the steers which were confined.

TABLE III. Average Amount of Feed Consumed Per Pound Gain and Cost Per 100 Pounds Gain.

RATION Feed per pound gain:	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
Cottonseed meal	1.73 lbs.	1.52 lbs.
Shelled corn	6.33 "	5.57 "
Sorghum silage	18.64 "	18.48 "
Corn stover	.87 "	.76 "
Oat straw	1.62 "	1.17 "
Cost per 100 pounds gain	$14.81 "	$12.47

It will be noted from Table III that less corn and cottonseed meal were required for a pound of gain in Lot 6 than in Lot 5. The amount of silage required per pound gain was about the same in both lots, while the amount of straw was somewhat more in Lot 5.

The cost per hundred pounds gain was $14.81 for Lot 5 and $12.47 for Lot 6, a difference of $2.34 per hundredweight in favor of the steers which were confined.

Lot 5. (Allowed Range) At the end of the experiment, April 24, 1916.

Lot 6. (Confined to Barn) At the end of the experiment, April 24, 1916.

TABLE IV. Summary of First Experiment.
November 15, 1915-April 24, 1916 (161 days)

	Lot. 5 Steers Allowed Range		Lot 6 Steers Confined to Barn	
Number of steers	10		10	
Initial weight of lot	9960	lbs.	10020	lbs.
Initial weight per steer	996	”	1002	”
Final weight of lot	12900	”	13360	”
Final weight per steer	1290	”	1336	”
Total gain of lot	2940	”	3340	”
Average daily gain per steer	1.82	”	2.07	”
Total feed consumed:				
Shelled corn	18598	”	18598	”
Cottonseed meal	5076.25	”	5068.25	”
Sorghum silage	54815	”	61755	”
Corn stover	2560	”	2560	”
Oat straw	4763	”	3913	”
Average daily feed consumed per steer:				
Shelled corn	11.55	”	11.55	”
Cottonseed meal	3.15	”	3.14	”
Sorghum silage	34.04	”	38.35	”
Corn stover (31 days)	8.26	”	8.26	”
Oat straw	2.95	”	2.43	”
Cost of feeds	$408.86		$416.70	
Pasture	26.83			
Cost of cattle at $7.25 per cwt.	722.10		726.45	
Total cost	1,157.79		1,143.15	
Cost per cwt. gain	14.81		12.47	
Pork produced	528	lbs.	380	lbs.
Cost of tankage fed hogs	$1.22		$1.22	
Value of pork produced at $9.00 per cwt.	47.52		34.20	
Net value of pork produced	46.30		32.98	
Necessary selling price pork included	8.61		8.30	
Necessary selling price pork not included	8.97		8.55	
Value of steers per cwt.	8.73		8.98	
Profit per steer incl. pork	1.46		8.95	
Manure saved per steer	2.47	tons	3.80	tons

Feed prices used: Shelled corn, 70c per bu.; cottonseed meal, $30 per ton; corn stover, $3.00 per ton; oat straw, $6.00 per ton; pasture for Lot 5, 50c per steer per month; sorghum silage, $3.00 per ton.

SUMMARY OF FIRST EXPERIMENT

A summary of the data obtained with the two lots of cattle is shown in Table IV. No charge was made for straw used for bedding nor for labor of feeding, neither is any credit given for manure produced by the cattle, it being considered that the value of the manure will much more than offset these two items.

Two hogs were run after each lot of steers. A small amount of tankage was fed the hogs in addition to the corn obtained from the droppings, but the cost of tankage fed was deducted from the value of pork produced before the latter was credited to receipts from the cattle.

It will be noted from Table IV that the steers confined made larger daily gains at less cost than did the steers running out. The difference in the daily gain was .25 pound per steer and the difference in the cost of gains was $2.34 per hundredweight in favor of Lot 6.

The necessary selling price required to come out even for Lot 5, with pork included, was $8.61 per hundredweight, while the valuation as made by committee of experts was $8.73 per hundredweight, making a net profit of $1.46 per steer. In Lot 6, the necessary selling price to come out even was $8.30 per hundredweight, the valuation was $8.98 per hundredweight and the net profit per steer was $8.95. This was a difference in net profit of $7.49 per steer in favor of the Lot 6 which was confined.

It is to be noted that in the financial results of this experiment, the fact was not taken into account that about .53 per cent more manure was saved where the steers were confined than where they ran out on pasture.

SECOND EXPERIMENT IN FEEDING STEERS HAVING ACCESS TO BARN AND RANGE VS. STEERS CONFINED TO BARN.

This experiment was conducted like the previous one with the exception that a different combination of feeds was used. No corn was used in the ration in this experiment. Lot 5 was allowed the run of a barn and a twenty-acre bluegrass pasture. Lot 6 was confined to a barn and covered lot.

The steers received wheat straw during the first period while they were being placed on a full feed of cottonseed meal and silage. The ration used during the remainder of the experiment consisted of cottonseed meal, silage and bluegrass chaff. The two lots of steers were fed all the roughage they would eat without waste.

TABLE V. Average Amount of Feed Consumed Daily Per Head by Fattening Steers, by Periods.

November 27, 1916-April 23, 1917 (147 days).

RATION	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
First Period (29 days)		
Cottonseed meal	1.17 lbs.	1.15 lbs.
Sorghum silage	31.90 "	31.72 "
Wheat straw	5.86 "	11.54 "
Bluegrass chaff	3.81 "	5.62 "
Second Period (28 days)		
Cottonseed meal	2.14 "	2.14 "
Sorghum silage	49.28 "	49.28 "
Bluegrass chaff	6.00 "	6.00 "
Third Period (28 days)		
Cottonseed meal	3.35 "	3.35 "
Sorghum silage	49.91 "	49.91 "
Bluegrass chaff	6.00 "	6.00 "
Fourth Period (28 days)		
Cottonseed meal	4.27 "	4.27 "
Sorghum silage	47.73 "	50.01 "
Bluegrass chaff	4.82 "	5.04 "
Fifth Period (34 days)		
Cottonseed meal	5.33 "	5.76 "
Sorghum silage	38.80 "	49.83 "
Bluegrass chaff	3.35 "	4.64 "

It will be noted that during the first month there was little difference in the consumption of cottonseed meal and silage in the two lots, but there was quite a difference in the amount of straw and bluegrass chaff eaten. This probably was because the steers in Lot 5 were getting a considerable amount of grass at this time and did not require so much roughage.

During the second and third periods the amount of feed eaten by the two lots was exactly the same, while in the last two periods Lot 6 consumed more roughage than did Lot 5.

Cottonseed meal was increased gradually during the entire 147 days. The average daily ration of cottonseed meal was practically the same for both lots except in the fifth period in which Lot 6 consumed .43 of a pound more per steer, daily, than Lot 5. This was because a steer in Lot 5 was off feed for a few days. The amount of silage remained about the same after a full feed was reached until the last period, when Lot 6 ate more silage than Lot 5. This was due to a steer of Lot 5 going off feed for a few days and also because fresh grass was beginning to appear, which the steers relished. The amount of bluegrass chaff eaten reached a maximum in the second and third periods and gradually decreased thereafter.

TABLE VI. Average Daily Gain Per Steer by Periods.
November 27, 1916-April 23, 1917 (147 days).

MONTHS	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
First Period (29 days)	1.60 lbs.	.93 lbs.
Second Period (28 days)	.98 "	1.18 "
Third Period (28 days)	1.14 "	1.54 "
Fourth Period (28 days)	1.25 "	1.50 "
Fifth Period (34 days)	1.05 "	1.57 "
Total gain per steer	177.00 "	198.20 "
Average daily gain for entire period	1.20 "	1.35 "

It will be seen from Table VI that the steers which were confined made better gains during the last four periods than did those running on pasture. They seemed to be a little slow in getting started, however, and fell considerably behind Lot 5 in the first 29 days.

The total gain per steer for the entire 147 days was 177 pounds for Lot 5 and 198.2 pounds for Lot 6—a difference of

21.2 pounds per steer in favor of the steers confined. The average daily gain was 1.20 pounds per steer in Lot 5 and 1.35 pounds per steer in Lot 6, a difference of .15 of a pound in favor of Lot 6.

TABLE VII. Average Amount of Feed Consumed Per Pound Gain and Cost Per 100 Pounds Gain.

RATION	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
Feed per pound gain:		
Cottonseed meal	2.80 lbs.	2.54 lbs.
Sorghum silage	36.30 "	34.49 "
Bluegrass chaff	3.98 "	4.09 "
Wheat straw	.96 "	1.69 "
Cost per 100 pounds gain	$18.07	$15.94

Lot 5. (Allowed Range) At the end of the experiment, April 23, 1917.

Lot 6. (Confined to Barn) At the end of the experiment, April 23, 1917.

We note from Table VII that the steers running on pasture required .26 of a pound more cottonseed meal and 1.81

pounds more silage per pound gain than did those in the closed lot. The amount of straw and bluegrass chaff consumed per pound gain was slightly less, however, in Lot 5, for this experiment.

The cost per hundred pounds gain was $18.07 for Lot 5 and $15.94 for Lot 6, a difference of $2.13 per hundredweight in favor of the steers confined.

TABLE VIII. Summary of Second Experiment.
November 27, 1916-April 23, 1917 (147 days).

	Lot. 5 Steers Allowed Range		Lot 6 Steers Confined to Barn	
Number of steers	10		10	
Initial weight of lot	10470	lbs.	10421	lbs.
Initial weight per steer	1047	"	1042.1	"
Final weight of lot	12240	"	12403	"
Final weight per steer	1224	"	1240	"
Total gain of lot	1770	"	1982	"
Average daily gain per steer	1.20	"	1.35	"
Total feed consumed:				
Cottonseed meal	4962.5	"	5030	"
Sorghum silage	64259.0	"	68375	"
Wheat straw	1702	"	3348	"
Bluegrass chaff	7056	"	8107	"
Average daily feed consumed per steer:				
Cottonseed meal	3.37	"	3.42	"
Sorghum silage	43.72	"	46.51	"
Wheat straw (29 days)	5.86	"	11.54	"
Bluegrass chaff	4.79	"	5.51	"
Cost of feeds	$295.50		$316.07	
Pasture	24.50			
Cost of cattle at $8.50 per cwt.	889.95		885.78	
Total cost	1,209.95		1,201.85	
Cost per cwt. gain	18.07		15.94	
Necessary selling price	9.88		9.69	
Value of steers per cwt.	10.00		10.00	
Profit per steer	1.40		3.81	
Manure produced per steer	2.29	tons	4.24	tons

Feed prices used: Cottonseed meal, $41.60 per ton; sorghum silage, $5.25 per ton; wheat straw, $7.00 per ton; bluegrass chaff, $5.00 per ton; pasture for Lot 5, 50c per steer per month.

Table VIII shows a summary of the results obtained with the two lots of cattle in the second experiment. It will be noted that these results are very similar to those secured in the first experiment in that the steers confined made a larger daily gain, a more economical gain, and there were 1.95 tons more manure per steer taken from the side of the barn where the steers were confined than from the side to which the steers had access as well as the run of the pasture. It seemed that there was not so much difference in the finish of the two lots this year, however, and they were valued at the same price by expert cattle men.

It was necessary for Lot 5 to sell at $9.88 per hundredweight in order to come out even. The valuation was $10.00 per hundredweight and the profit per steer was $1.40.

Lot 6 would have had to sell at $9.69 per hundredweight to come out even and the valuation was $10.00 per hundredweight, thus returning a net profit of $3.81 per steer. This gave a difference in net profit of $2.41 per steer in favor of the steers confined. The difference in net profit per steer between the two lots was smaller than that obtained the previous year, due to the fact that the finish of the two lots of steers was about the same.

As corn did not enter the ration in this experiment there were no hogs following the steers.

There were 1.95 tons more manure per steer secured from the half of the barn where the cattle were confined than from the half where the cattle were allowed to go on pasture at will.

THIRD EXPERIMENT IN FEEDING STEERS HAVING ACCESS TO BARN AND RANGE VS. STEERS CONFINED TO BĀRN.

In this experiment, conditions were the same as in the two previous ones. The combination of feeds was much the same with the exception that corn was introduced into the ration at the beginning of the fifty-sixth day, whereas, in the first experiment, corn was fed during the entire 161 days and in the second experiment no corn was fed at any time.

TABLE IX. Average Amount of Feed Consumed Daily per Head, by Periods.

November 15, 1917-April 4, 1918 (140 days).

RATION	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
First Period (35 days)		
Cottonseed meal	3.02 lbs.	3.02 lbs.
Sorghum silage	40.91 "	40.89 "
Corn stover	4.05 "	3.41 "
Wheat straw	2.69 "	1.52 "
Soybean straw	1.91 "	1.41 "
Second Period (21 days)		
Cottonseed meal	3.80 "	3.80 "
Shelled corn	.14 "	.14 "
Sorghum silage	49.47 "	49.47 "
Wheat straw	2.57 "	2.81 "
Soybean straw	2.38 "	2.38 "
Third Period (35 days)		
Cottonseed meal	3.92 "	3.92 "
Shelled corn	4.70 "	4.50 "
Sorghum silage	48.57 "	48.71 "
Wheat straw	1.87 "	2.16 "
Soybean straw	1.28 "	1.28 "
Fourth Period (28 days)		
Cottonseed meal	3.92 "	4.04 "
Shelled corn	7.95 "	8.17 "
Corn silage	38.17 "	39.92 "
Wheat straw	.32 "	.29 "
Fifth Period (21 days)		
Cottonseed meal	4.31 "	4.13 "
Shelled corn	10.84 "	10.18 "
Corn silage	32.00 "	31.52 "

It will be seen from Table IX that the amount of feed consumed in the two lots was almost the same thru the entire experiment. Steers in Lot 5 did not have quite as good an appetite as those in Lot 6 during the fourth period, but they consumed slightly more feed in the last period, which raised their average and made the amount of feed eaten by the two lots during the last 56 days about equal.

No straw was eaten by either lot during the last period.

It must be remembered, however, that it was the aim to feed the same amount of corn and cottonseed meal to each lot and that any difference was due to a steer being off feed for a day or two when the amount of feed was reduced.

TABLE X. Average Daily Gain Per Steer by Periods.
November 15, 1917-April 4, 1918 (140 days).

	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
First Period (35 days)	2.75 lbs.	2.30 lbs.
Second Period (21 days)	.19 "	1.55 "
Third Period (35 days)	1.43 "	1.27 "
Fourth Period (28 days)	2.00 "	1.90 "
Fifth Period (21 days)	1.32 "	1.78 "
Total gain per steer	234.00 "	248.00 "
Average daily gain for entire period	1.67 "	1.77 "

It will be seen from Table X that the steers running on pasture made somewhat larger gains during the first, third, and fourth periods than did those confined, but their gains being so very poor in the second period and somewhat off in the last period, they were not able to average up with Lot 6.

The total gain per steer for Lot 5 was 234 pounds, and the average daily gain per period was 1.67 pounds, being somewhat less than that for Lot 6, which was 248 pounds gain per steer and 1.77 pounds daily gain per period.

TABLE XI. Average Amount of Feed Consumed Per Pound Gain and Cost Per 100 Pound Gain

RATION Feed per pound gain:	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
Cottonseed meal	2.23 lbs.	2.10 lbs.
Shelled corn	2.34 "	2.26 "
Sorghum silage	17.39 "	16.36 "
Corn silage	7.86 "	7.58 "
Corn stover	.60 "	.48 "

RATION	Lot. 5 Steers Allowed Range	Lot 6 Steers Confined to Barn
Soybean straw	.69 "	.62 "
Wheat straw	.95 "	.79 "
Cost per 100 pounds gain	$22.61	$20.30

It will be seen from Table XI that it required .13 of a pound more cottonseed meal, .08 of a pound more corn, 1.03 pounds more sorghum silage, .12 of a pound more corn stover, .07 of a pound more soybean straw and .16 of a pound more wheat straw, and .28 of a pound more corn silage to produce one pound of gain on the steers running on pasture than on those confined.

The cost per 100 pounds gain was $22.61 for steers on pasture and $20.30 for those confined, being $2.31 per steer in favor of the steers confined.

Lot 5. (Allowed Range) At the end of the experiment, April 4, 1918.

Lot 6. (Confined to Earn) At the end of the experiment, April 4, 1918.

TABLE XII. Summary of Third Experiment.
November 15, 1917-April 4, 1918 (140 days).

	Lot. 5 Steers Allowed Range		Lot 6 Steers Confined to Barn	
Number of steers	10		9	
Initial weight of lot	9125	lbs.	8218	lbs.
Average weight per steer	912	”	913	”
Final weight of lot	11466	”	10456	”
Average final weight per steer	1146	”	1161	”
Total gain of lot	2341	”	2238	”
Average gain per steer	234	”	248	”
Average daily gain per steer	1.67	”	1.77	”
Total feed consumed:				
Cottonseed meal	5236	”	4707	”
Shelled corn	5593	”	5072	”
Corn stover	1418	”	1076	”
Soybean straw	1619	”	1395	”
Wheat straw	2228	”	1765	”
Sorghum silage	40716	”	36632	”
Corn silage	18410	”	16965	”
Average daily feed consumed:				
Cottonseed meal	3.74	”	3.73	”
Shelled corn (last 85 days)	6.57	”	6.63	”
Corn stover (1st 6 days only)	23.63	”	19.92	”
Soybean straw (first 65 days only)	2.49	”	2.38	”
Wheat straw	1.59	”	1.40	”
Sorghum silage (90 days)	45.24	”	45.22	”
Corn silage (50 days)	36.82	”	37.70	”
Total cost of feeds	$504.47		$454.49	
Pasture	25.00			
Cost of cattle at $9.25 per cwt.	844.06		760.16	
Total cost	1,373.53		1,214.65	
Cost per cwt. gain	22.61		20.30	
Pork produced	30	lbs.	56	lbs.
Value of pork produced at $17 per cwt.	$5.10		$9.52	
Necessary selling price, pork inc.	11.93		11.52	
Necessary selling price, pork not inc.	11.97		11.61	
Value of steers per cwt.	12.95		13.30	
Profit per steer, including pork	11.56		20.50	
Manure produced per steer	1.76	tons	2.66	tons

Feed prices used: Cottonseed meal, $53.00 per ton; shelled corn, $1.25 per bu.; corn silage, $8.00 per ton; sorghum silage, $7.25 per ton; soybean straw, $8.00 per ton; wheat straw, $8.00 per ton; corn stover, $6.00 per ton; pasture for Lot 5, 50 cents per steer per month.

Table XII is a summary of the third experiment in this series and brings out practically the same results that had been obtained in the two previous experiments, namely, that the steers confined to the barn made more rapid gains at less cost per hundredweight, showed a better finish, and returned a larger net profit than did the steers allowed range. More manure also was conserved from the steers confined than from those allowed range.

Lot 5 made an average daily gain of 1.67 pounds per steer, the cost per hundredweight of which was $22.61; the selling price required to come out even, (pork credited) was $11.93 per hundredweight. This lot of steers was valued at $12.95 per hundredweight, returning a profit of $11.56 per steer. The manure produced was 1.76 tons per steer. Lot 6 made an average daily gain of 1.77 pounds per steer and each 100 pounds of gain cost $20.30. The required selling price (pork included) to break even was $11.52 per hundredweight. This lot of steers was valued at $13.30 per hundredweight, returning a net profit of $20.50 per steer. The manure produced by Lot 6 was 2.66 tons per steer or 51 per cent greater than by Lot 5.

SUMMARY

1. The three experiments show that the average daily gain per steer of the steers confined in the barn was .16 pounds greater than that made by the steers having access to barn and range.

2. The average cost per hundredweight gain was $2.26 less for the steers confined than for those allowed range.

3. The average value of finished steers was 20 cents per hundredweight larger for those confined than for those with range.

4. The average net profit, including credit for pork produced, was $6.28 more per steer for those confined than for those having range.

5. The average amount of manure per steer taken from that part of the barn where the steers (Lot 6) were confined was 3.56 tons and from that part of the barn to which the steers (Lot 5) had access as well as the run of a twenty-acre pasture was 2.17 tons or 64 per cent more where the steers were confined.

ACKNOWLEDGMENT

The author acknowledges valuable assistance on the part of Mr. Morgan O. Hughes in planning the barn and experiments as outlined in this bulletin. Mr. Hughes was formerly an extensive feeder of steers under cover in Warren County, Kentucky, and is now connected with the Department of Farm Management and Markets of this Station.

Small steer-feeding barn used in this experiment.

B

Kentucky
Agricultural Experiment Station

University of Kentucky

BREEDING EXPERIMENTS WITH KENTUCKY MOUNTAIN EWES

BULLETIN NO. 243

Lexington, Ky.

July, 1922

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BULLETIN NO. 243

BREEDING EXPERIMENTS WITH KENTUCKY MOUNTAIN EWES

By L. J. HORLACHER and E. S. GOOD

Sheep from the mountain section of Kentucky play an important part in the sheep industry of the State. In former years, large numbers of native ewes were purchased for breeding, were used one or two years, and were then sent to market. This practis resulted in rapidly decreasing the numbers of these sheep, so that sheepmen are becoming interested in some method by which they can produce their own breeding ewes, using the native sheep as a foundation.

The best types of native ewes have many good qualities, foremost among which are their prolificacy and their mothering and milking qualities. The use of scrub rams on the native ewes has had a very deleterious effect on the conformation of their produce. The most pronounced defects of the native stock are: small size; late maturity; lack of symmetry and balance; poor fattening qualities; and coarse, light wool. The exact origin of these sheep is unknown, but they evidently are descendants of some of the British breeds of mutton sheep which were imported into this country at an early date.

OBJECT

Fully realizing the existence of these conditions the Animal Husbandry Department of the Kentucky Experiment Station, in the fall of 1915, began an experiment the object of which was the improvement of the Kentucky mountain ewe with the purpose of producing a superior general-utility farm ewe that would shear more wool of a finer quality and would produce a superior type of market lamb; also of obtaining data as to the form, quality, finish and gains of lambs out of ewes sired by rams of the Rambouillet, Hampshire, Southdown and Cheviot breeds.

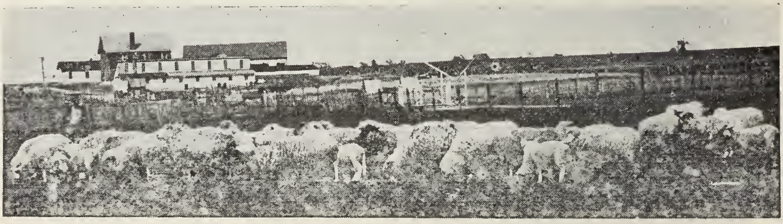

Fig. 1. The flock, May, 1918.

SHEEP USED

Thirty-two head of native ewes were purchased near London, Laurel County, Kentucky, in September, 1915. These ewes were yearlings and two-year-olds, typical of the mountain sheep and free from disease (Figs. 2, 3, 5).

For the introduction of Merino blood a yearling Rambouillet ram was purchased. This was a good, big, rugged ram, a trifle up-standing, but well covered with a fleece of good quality. He was bred to a part of the native ewes to produce the half-blood Rambouillet ewes which were in turn bred to mutton rams for the production of market lambs. The Rambouillet ram was used in 1915, 1916 and 1917 (Fig. 8).

A two-year-old Southdown ram was used in 1915. He was bred to a part of the mountain ewes. No Southdown was used in 1916. In 1917 another Southdown ram was used. In 1918 a

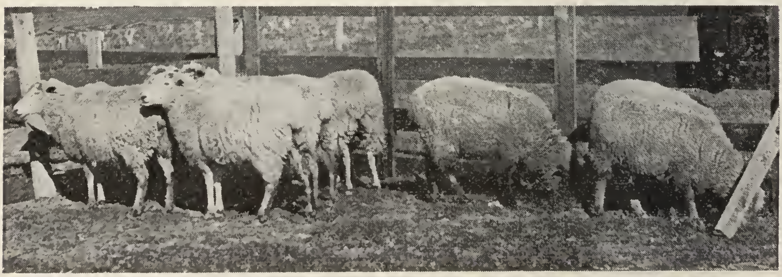

Fig. 2. Mountain ewes. Age 2 and 3 years. They are leggy and coarse.

yearling Southdown ram was purchased. This ram was used in 1918, 1919 and 1920 (Figs. 26-28).

Three Hampshire rams were used: the first in 1915, 1916, 1917 and 1918, the second in 1919, and the third in 1920 (Fig. 13).

In 1918 a Cheviot ram lamb was purchased. He was used in 1918, 1919 and 1920. A Cheviot ram lamb was used in 1920 (Fig. 37).

A scrub ram was used on a part of the ewes in 1916. (Fig. 4).

Several scrub lambs were dropt in the 1916 crop, as six of the ewes proved to be with lamb when purchased.

All ewes and lambs were numbered by the use of metal ear-tags.

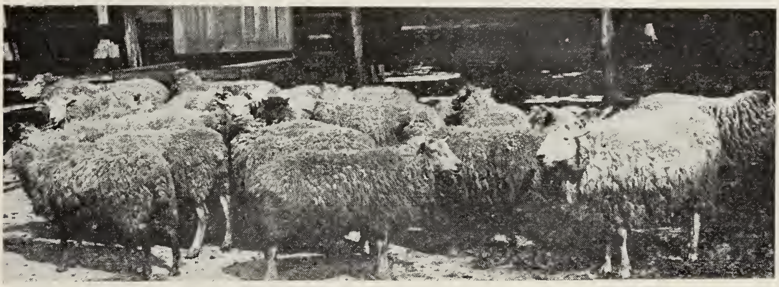

Fig. 3. Mountain ewes, all over 4 years old. Weight 98 pounds. The wool is coarse and open; the heads and legs are bare. The ewe at the right has rubbed off the wool from the under side of her neck.

METHOD OF PROCEDURE

The general method of procedure was this: The Rambouillet, Hampshire, Southdown and Cheviot rams were bred to native mountain ewes. The half-blood Rambouillet ewes resulting from this first cross were bred to the rams of the three mutton breeds. The half-blood mutton ewes resulting from this second cross were then bred to other mutton rams of the same breed, thus preventing any mixture of Hampshire, Southdown or Cheviot blood.

The half-blood Hampshire ewes resulting from breeding the Hampshire ram to the mountain ewes were bred to a Hamp-

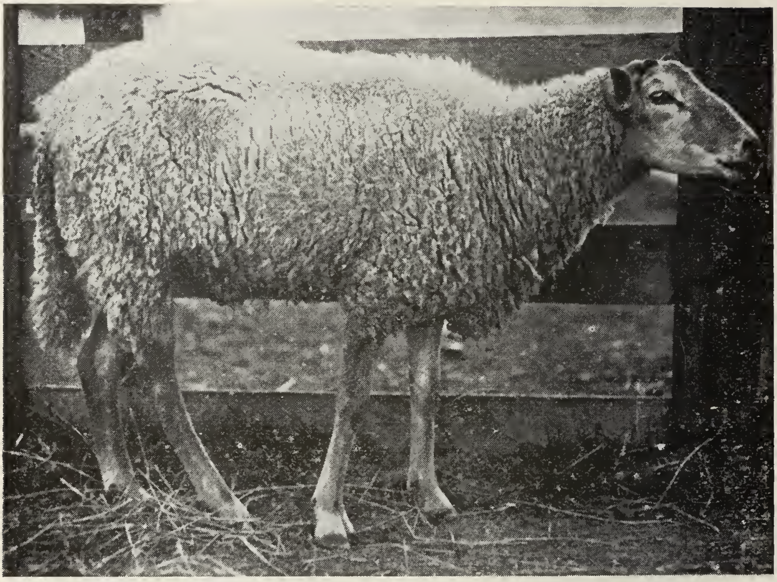

Fig. 4. Mountain ram. He lacks masculinity, has a weak head, long thin neck, long, bare, legs, coarse, light fleece, and has little meat on his body. He is especially lacking in vigor and vitality. Weight 90 pounds.

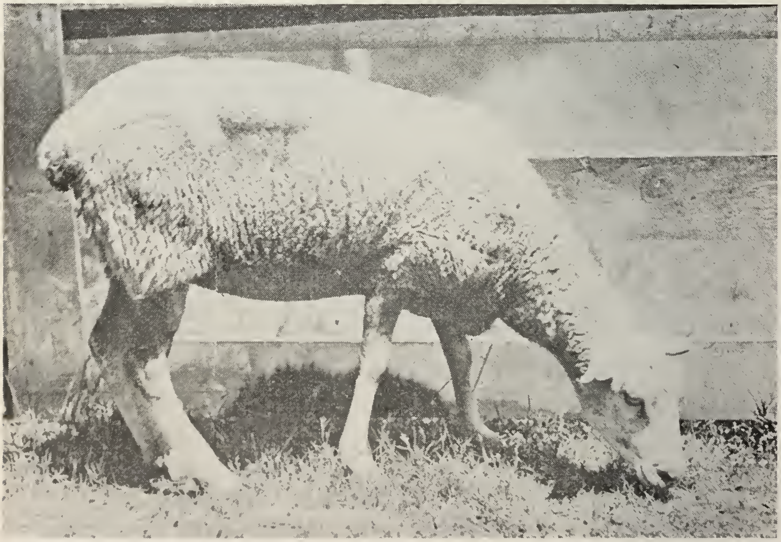

Fig. 5. Mountain ewe. A rugged ewe, but has very little meat covering and a light fleece.

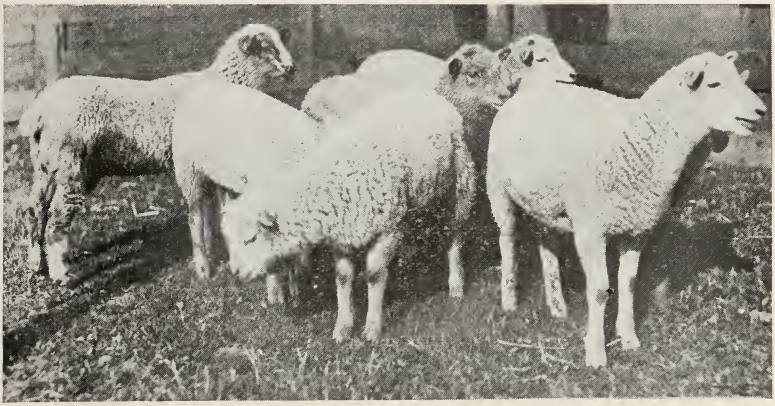

Fig. 6. Mountain lambs, age 3 months. Their heads are narrow, necks thin and long, bodies narrow and shallow. Their backs are weak and their legs long.

shire ram. This process was continued so that high-grade Hampshires were obtained. The same method was followed with the Southdown and the Cheviot rams.

In 1915 the breeding season began on October 11. The beginning date during the next four years was September 16. In 1920 the date was August 11. In each year the rams were allowed to run with the ewes for a period of 40 days, and at the end of that time they were taken away from the ewes. During the first four years the rams were turned with the ewes only at night. In 1919 and 1920, however, they were permitted to be with the ewes night and day.

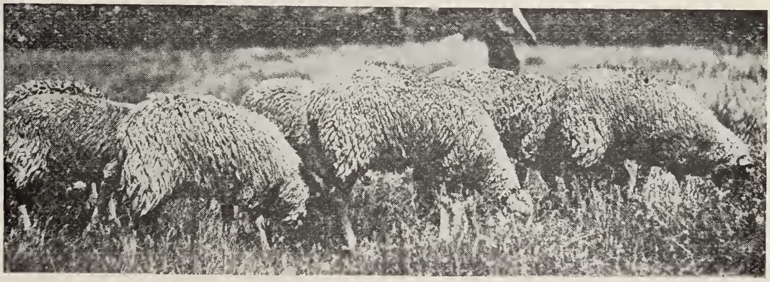

Fig. 7. Mountain lambs. Age 7 months. Lambs like these do not look well on the market.

The mountain sheep in their native haunts are permitted to roam around at will over the hills and valleys. Little or no extra feed is given to them at any time of the year. Conditions at the Experiment Station Farm were such, however, that the ewes had to be handled quite differently. Lack of pasture made it necessary to feed grain and hay during at least six months of the year. Because of the excessive danger from dogs the ewes were shut up each night throughout the year in either a barn or a small enclosure of slightly over one acre surrounded by a dog-proof fence. Thus grain was fed throughout the entire year to replace the pasture which could not be used at night.

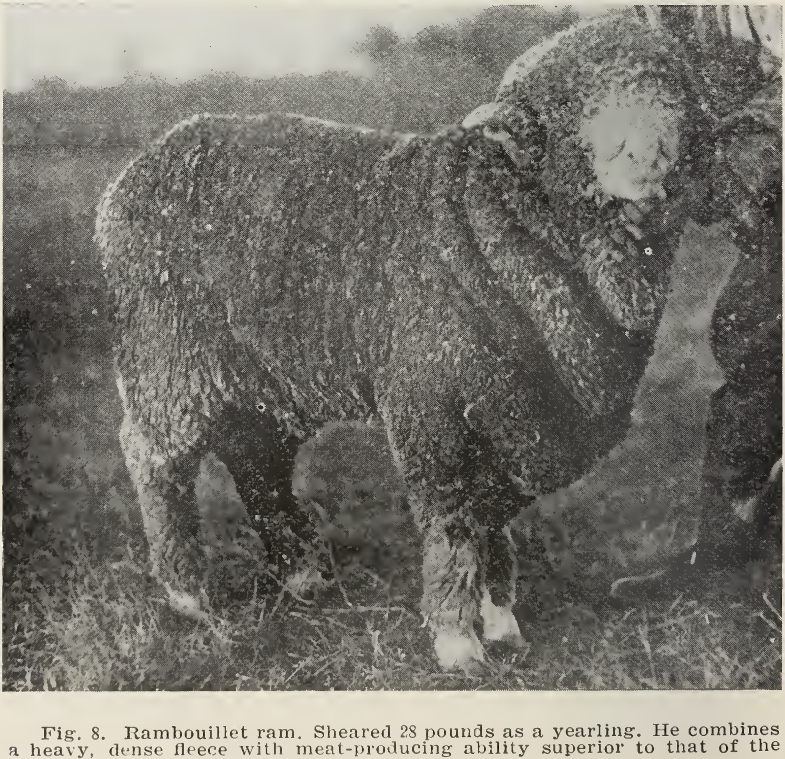

Fig. 8. Rambouillet ram. Sheared 28 pounds as a yearling. He combines a heavy, dense fleece with meat-producing ability superior to that of the mountain ram. Weight 165 pounds.

EXPLANATION OF ABBREVIATIONS AND TERMS

Mt.	—Mountain, native or scrub.
R.	—Rambouillet.
H.	—Hampshire.
S.	—Southdown.
C.	—Cheviot.
R-Mt.	—Half-blood Rambouillet, result of breeding a Ramboullet ram to a mountain ewe.
H-Mt.	—Half-blood Hampshire, result of breeding a Hampshire ram to a mountain ewe.
S-Mt.	—Half-blood Southdown, result of breeding a Southdown ram to a mountain ewe.
C-Mt.	—Half-blood Cheviot, result of breeding a Cheviot ram to a mountain ewe.
H-(R-Mt.)	—Half-blood Hampshire, result of breeding a Hampshire ram to a R-Mt. ewe.
S-(R-Mt.)	—Half-blood Southdown, result of breeding a Southdown ram to a R-Mt. ewe.
C-(R-Mt.)	—Half-blood Southdown, result of breeding a South-ram to a R-Mt. ewe.
H-(H-Mt.)	—Three-quarter-blood Hampshire, result of breeding a Hampshire ram to a H-Mt. ewe.
S-(S-Mt.)	—Three-quarter-blood Southdown, result of breeding a Southdown ram to a S-Mt. ewe.
C-(C-Mt.)	—Three-quarter-blood Cheviot, result of breeding a Cheviot ram to a C-Mt. ewe.
H-(H-(R-Mt.)	—Three-quarter-blood Hampshire, result of breeding a Hampshire ram to a H-(R-Mt.) ewe.
S-(S-(R-Mt.)	—Three-quarter-blood Southdown, result of breeding a Southdown ram to a S-(S-Mt.) ewe.
H-(H-(H-Mt.)	—Seven-eighths-blood Hampshire, result of breeding a Hampshire ram to a H-(H-Mt.) ewe.

Part I.

LAMB PRODUCTION

First Year, 1915-1916

On October 11, 1915, thirty mountain ewes were divided into three lots of ten each. The Southdown ram was placed with lot 1, the Hampshire ram with lot 2, and the Rambouillet ram with lot 3. The rams were turned with the ewes each night and taken away during the day. The breeding season continued over a period of forty days.

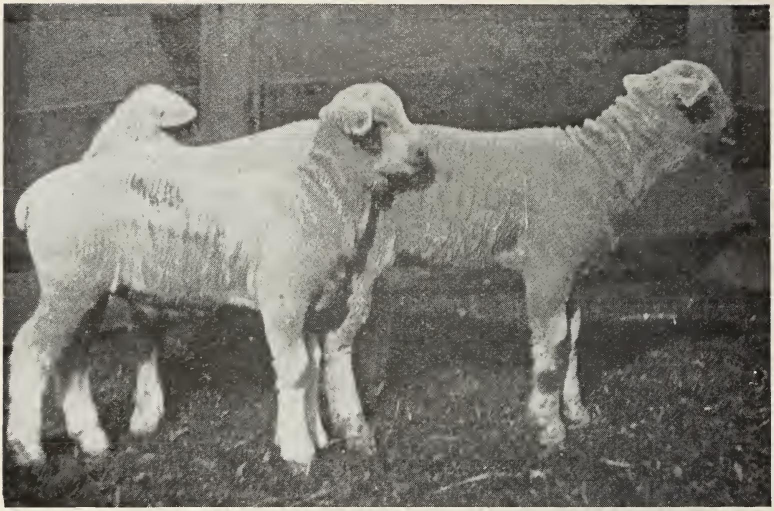

Fig. 9. Lambs sired by the Rambouillet ram out of mountain ewes. They are rangy, but have a good covering of meat.

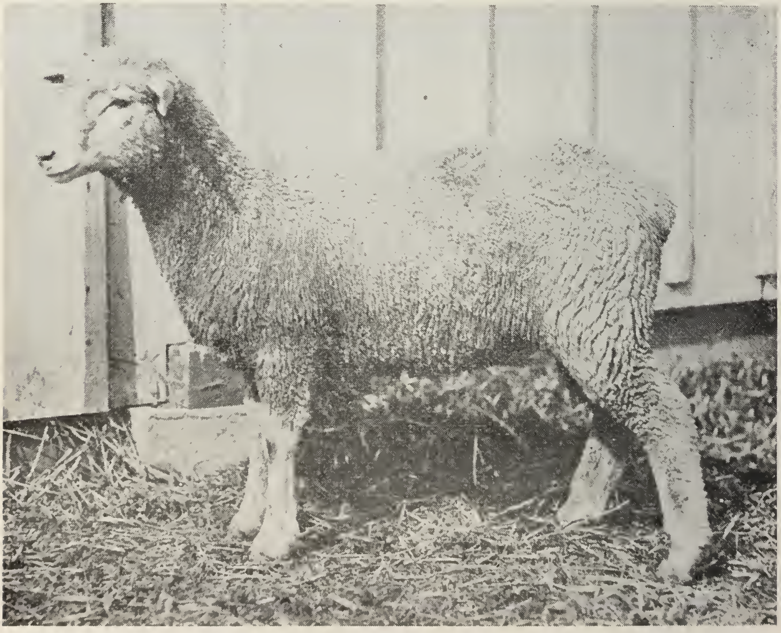

Fig. 10. Rambouillet-mountain lamb, age 5 months. The fleece is much denser than that of the mountain lamb.

Six of the ewes proved to be with lamb at the time of purchase, evidently to a very superior type of mountain ram.

On December 13 silage was introduced into the ration. At first only 8 pounds per day were fed, but this was increased gradually until each ewe was eating 1.5 pounds per day. After the bluegrass pasture became unfit for further use and the sheep were becoming accustomed to silage, grain was fed at the rate of 14 pounds to the 30 ewes per day. The grain mixture consisted of two parts of oats and one part of bran, by weight, and was fed only in the morning. At night 1 pound of clover hay per head was fed. Exercise was given the ewes by permitting them to run on a corn stubble field during good days.

Ewes with young lambs were fed 2 pounds of the grain mixture mentioned above, 2 pounds of corn silage, and mixed hay ad libitum. The ewes came into parturition with very little milk.

On April 1, 1916, the silage was removed from the ration. Bluegrass and rye pastures were substituted. Hay was discontinued April 18.

Table I shows the weights of the lambs at birth and at weaning time.

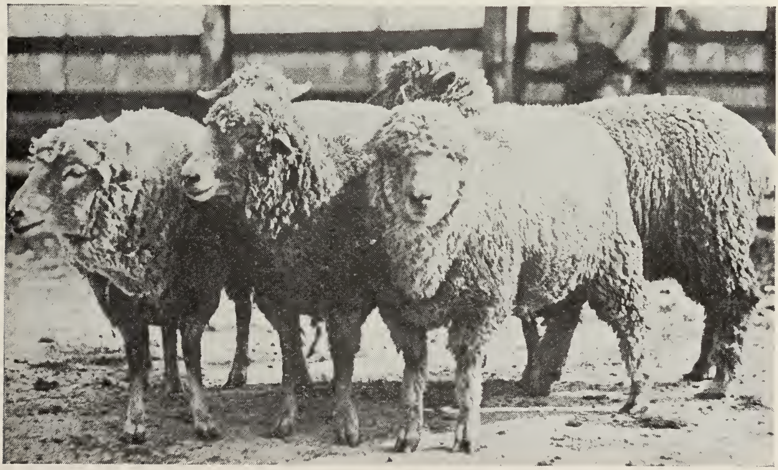

Fig. 11. Yearling Rambouillet-mountain ewes and wethers. These sheep are vigorous and hardy. They have more wool on their faces, legs and underlines than have the mountain sheep.

TABLE I

Weights of Lambs, First Year, 1915-1916

No. of lambs	Breeding	Ave. Wt. at birth	Ave. final weight (age 120 days)	Rank
9	R-Mt.	8.3 lbs.	73.5 lbs.	1
9	S-Mt.	6.66 lbs.	71.5 lbs.	2
6	H-Mt.	7.3 lbs.	70.0 lbs.	3
6	Mt.	7.5 lbs.	56.5 lbs.	4

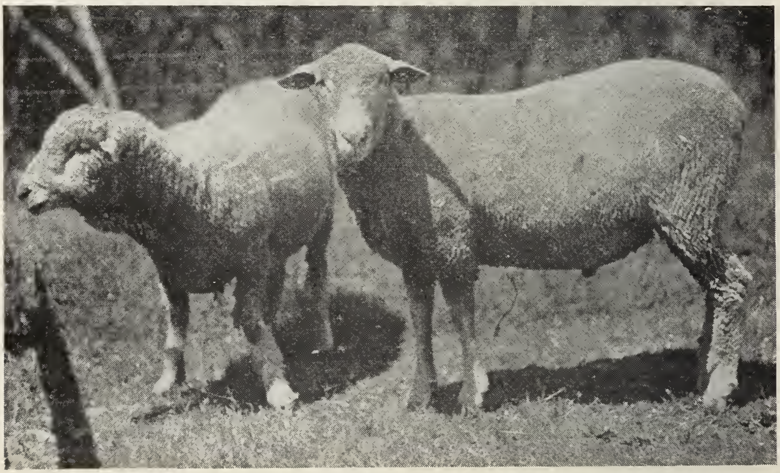

Fig. 12. Yearling Rambouillet mountain wethers two months after shearing. The bodies of these wethers are fairly well filled out and covered with meat.

Some of the lambs were sold on August 9. Those which were kept for experimental purposes were weaned on the same date. In Table I the average of the lambs is given as 120 days. Since the mountain lambs (Figs. 6, 7, 45-47) were 4 to 7 weeks older than any of the others and since the other lambs were dropt over a period of six weeks, the average final weight was determined, not by taking the weight of each lamb on August 9, but by taking the weight of each individual lamb the day it was 120 days old and then averaging the weights of the lambs of each cross.

Table I shows no relationship between the birth weights and the final weights of the lambs. It happened that the R-Mt. lambs were the largest both at birth and at weaning time, but, on the other hand, the S-Mt. lambs were the lightest at birth and ranked second in weight at weaning time. There was very little difference in the final weights of any of the lambs sired by purebred rams. The scrub lambs not only weighed 13.5 pounds per head less than the lightest of those sired by one of the purebred rams, but they were much more narrow, leggy, and shallow bodied, and lacked meatiness and symmetry of build.

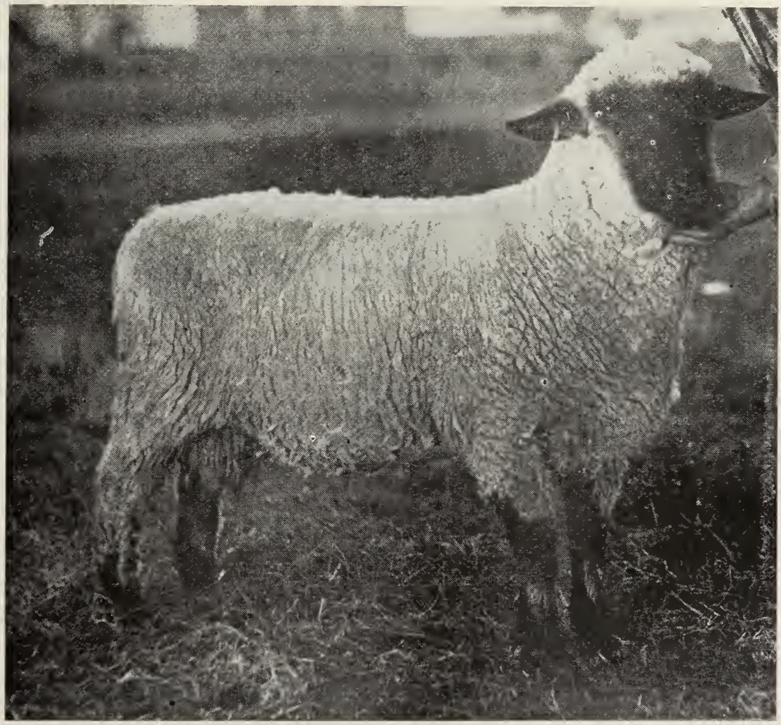

Fig. 13. Hampshire ram lamb, used 1915 to 1918. This ram weighed 230 pounds in breeding condition when two years old, and 260 pounds when four years old.

Second Year, 1916-1917

The breeding season began on September 16, 1916. The ewes and rams were handled as in the preceding year. Eight of the ewes were bred to the Hampshire ram, two to the Rambouillet and the remainder to a mountain ram purchased for $4.50 and weighing 90 pounds.

The rams were turned in with the ewes at night and taken away in the morning. The entire flock was very thrifty and in excellent condition.

The first lambs were dropt on February 6. They varied a great deal in color. The lambs from the scrub buck were yellowish-brown in color, with some white markings on the face and legs. Lambs sired by the Hampshire ram had black faces and ears, black and white markings on the body, and black or dark brown color on the legs. They had typical large dark-colored Hampshire ears. Lambs sired by the Rambouillet ram were of various colors. Some were dark brown, some light and almost

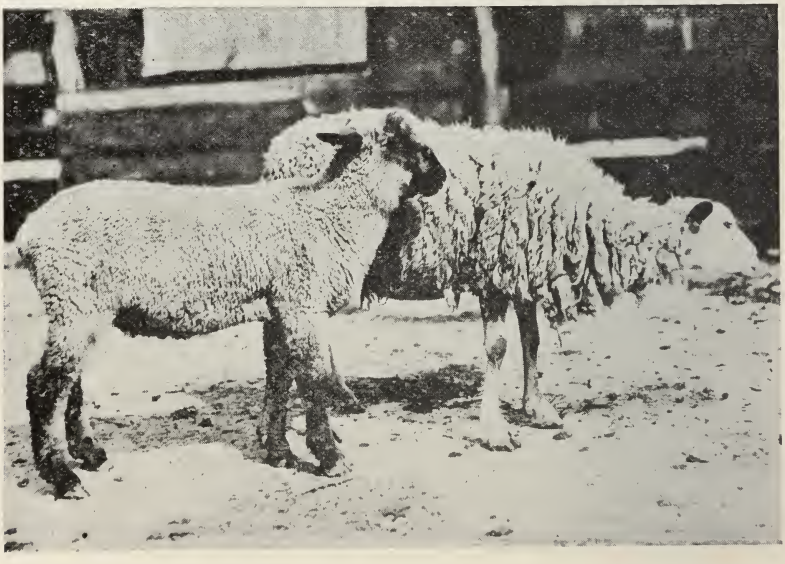

Fig. 14. Mountain ewe and her 50-day old lamb, sired by Hampshire ram. The lamb is much thicker and more blocky than its mother. It has a much denser fleece, more evenly distributed over the body. An early-maturing lamb.

white. They had heavy, dense, compact fleeces. All lambs were docked and all ram lambs were castrated when they were about 10 days of age.

On March 12 the lambs were given their first feed of grain. This consisted of a mixture of two parts of bran and one part of oats by weight. It was fed in a creep. One week later the ewes and lambs were turned on rye pasture. The lambs were weaned August 20.

Table II shows the weights of the lambs at birth and at weaning time.

TABLE II

Weight of Lambs, Second Year, 1916-1917

No. of lambs	Breeding	Ave. Wt. at birth	Ave. final weight (age 163 days)	Rank
3	R-Mt.	7.17 lbs.	93 lbs.	1
1	H-(H-Mt.)	8. lbs.	87 lbs.	2
19	H-Mt.	6.10 lbs.	75 lbs.	3
12	Mt.	7.43 lbs.	67 lbs.	4

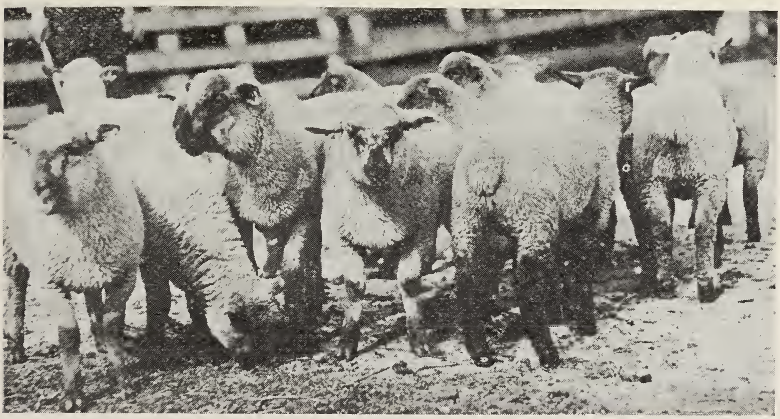

Fig. 15. Lambs sired by the Hampshire ram, out of mountain ewes, age 3 months. They are broader and thicker in front and are plumper and fuller behind than the mountain lambs.

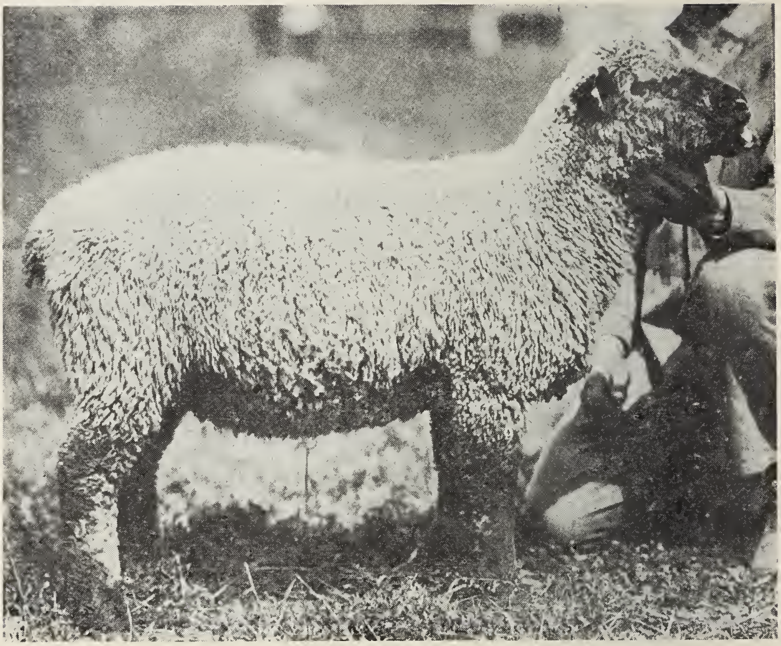

Fig. 16. Hampshire-mountain wether lamb, age 87 days. Weight 100 pounds. This lamb shows that the Hampshire cross lambs mature much earlier than the mountain lambs.

The final weights of the lambs in the second year were greater than those of the first year. However, the weights were taken when the lambs were 163 days old, as compared with 120 days in the preceding year. As in the first year's work,

Fig. 17. Hampshire-mountain lambs, age 6 months. These lambs are very uniform in size, form and fleece.

there was no relationship between the birth weight and the final weight.

As only one three-quarter Hampshire lamb is listed, nothing definite can be concluded as to its relative position when compared with the other crosses in which more individuals are concerned. Lambs sired by the Rambouillet ram ranked first, 6 pounds heavier than the three-quarter Hampshire lamb, which, in turn, was 12 pounds heavier than the H-Mt. lambs. The mountain lambs were 8 pounds per head lighter than the H-Mt. lambs.

With one exception all ewes bred to the Hampshire ram dropt twins. Two of the three R-Mt. lambs were twins. There were only three sets of twins among the mountain lambs.

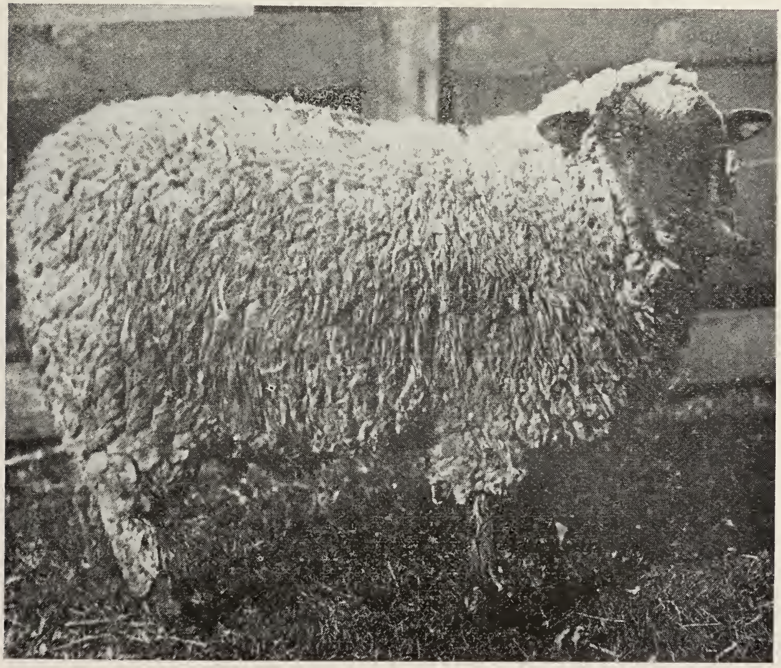

Fig. 18. Yearling Hampshire-mountain ewe. She is much more lowset and compact than the mountain ewes.

Third Year, 1917-1918

The breeding season of 1917 began on September 16. Lot 1, consisting of mountain and first-cross Hampshire and Rambouillet ewes, was bred to the Hampshire ram. Lot 2, consisting of first-cross Rambouillet ewes, was bred to the Southdown ram. The remaining mountain ewes were bred to the Rambouillet ram.

The rams were turned with the ewes at night and taken out in the morning. The ewes were given the run of an excellent bluegrass pasture and were fed half a pound per head of equal parts of oats and bran daily.

The winter was very severe, so that it was necessary to keep the ewes closely housed.

February was more mild. Lambing started on the 9th. The general method of handling was the same as in the two preceding years. The lambs were docked with hot pincers, with very successful results. All ram lambs were castrated when they were about two weeks of age. They were weaned on the fifth of September.

Table III shows the weights of the lambs at birth and at weaning time.

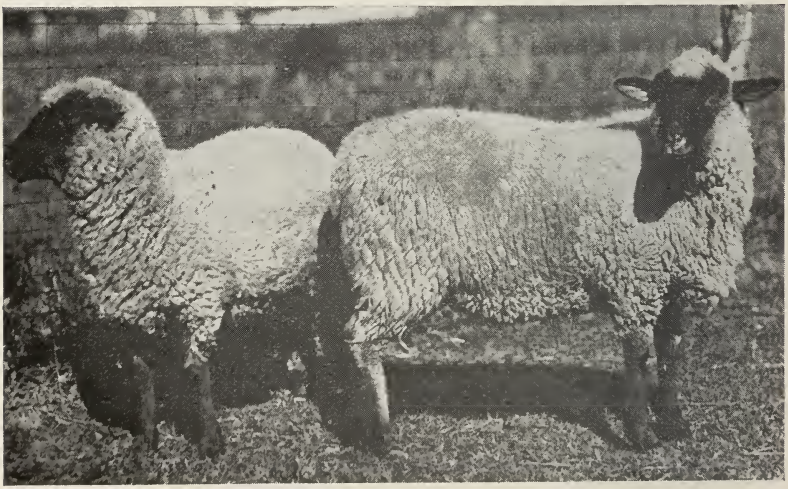

Fig. 19. Two-year-old Hampshire-mountain ewes, weight 118 pounds. These ewes are larger than the mountain ewes. They have more bone and substance. The black faces and legs show Hampshire breeding.

TABLE III

Weight of Lambs, Third Year, 1917-1918

No. of lambs	Breeding	Ave. wt. at birth	Ave. wt. July 1, 1918	Rank
6	H-Mt.	6.44	63.8	1
12	S-Mt.	6.54	58.8	2
12	R-Mt.	7.21	58.4	3
4	H-(R-Mt.)	6.5	55.5	4
2 (twins)	S-(R-Mt.)	6.5	49.5	5

The average age of all lambs on July 9 was approximately four months. The Rambouillet-mountain lambs dropt from first place, which they held in the first two years, to third place. The Hampshire cross on the mountain ewe led the list with an advantage of 5 pounds more than the Southdown-mountain cross, which was second. The second-cross Hampshire-Rambouillet-mountain ranked fourth and second-cross Southdown-Ram-

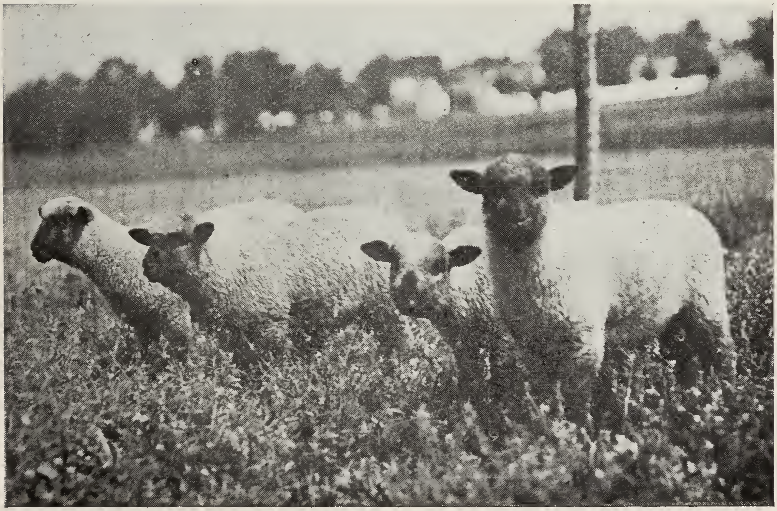

Fig. 20. Three-quarter Hampshire lambs, sired by the Hampshire ram, out of Hampshire mountain ewes. These lambs are more uniform than the H-Mt. lambs. They would attract a great deal of attention on the market.

bouillet-mountain lambs ranked at the bottom. These last two lambs, however, were twins.

Six of the ten Hampshire cross lambs, six of the fourteen Southdown cross lambs, and six of the twelve Rambouillet cross lambs were twins. The birth weights and final weights varied much as they did the first two years.

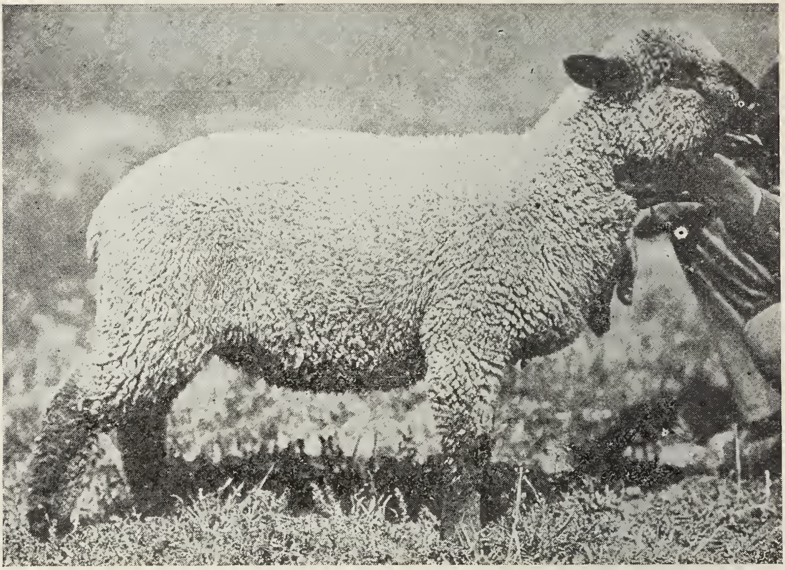

Fig. 21. Seven-eighths Hampshire ewe lamb, sired by the Hampshire ram, out of a three-quarter Hampshire ewe. She is slightly drooping in the rump, but otherwise very blocky and symmetrical.

Fourth Year, 1918-1919

In 1918, breeding began September 16. As in the previous years the ewes were divided into three lots. Lot 1 was bred to the Hampshire ram. The ewes were mountain, Hampshire-mountain, Hampshire-Rambouillet-mountain and Rambouillet-mountain. The remaining mountain ewes were placed in Lot 3 and bred to the Cheviot ram.

The rams were permitted to be with the ewes at night only. During the day the ewes were grazed on a rich bluegrass pasture, while at night they were kept in the barn. As the ewes

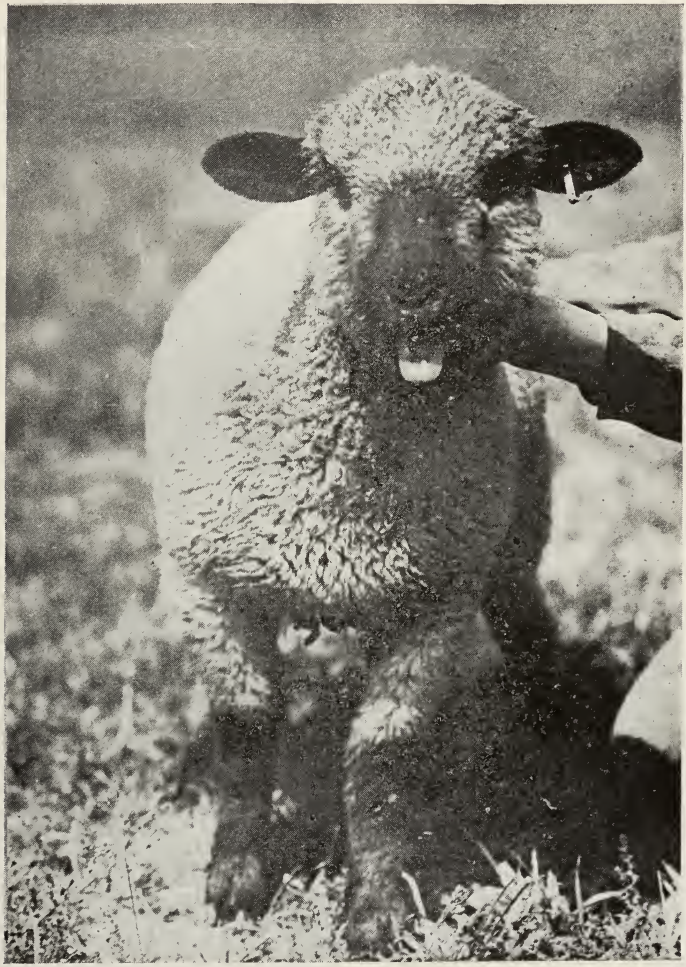

Fig. 22. Head of seven-eighths Hampshire ewe lamb shown in Fig. 21. It would be difficult to distinguish between this lamb and a pure bred Hampshire.

were very thin each was fed one pound of grain (10 parts oats and 1 part linseed oil meal) per day.

During October there was some slight digestive trouble among the ewes, causing a few of them to go blind for several days. The affected sheep were drenched with 140 cc. of a solution made up of one ounce of Epsom salts, 1/10 ounce gamboge and a little ginger. Every one recovered.

Beginning January 1, sorghum silage was fed to the ewes. This was continued for one month, and no bad effects were noted, altho a great deal of red mold was present in the silage.

Table IV gives the weights of the lambs at birth and at weaning time.

TABLE IV

Weights of Lambs, Fourth Year, 1918-1919

No. of lambs	Breeding	Ave. wt. at birth	Average final wt. (age 125 days).	Rank
2	H-(R-Mt.)	8.42 lbs.	66.75 lbs.	1
2 (twins.)	H-(H-(R-Mt.)	7.5 lbs.	64.75 lbs.	2
6	H-(H-Mt.)	6.38 lbs.	61.5 lbs.	3
7	H-(Mt.	6.32 lbs.	60. lbs.	4
2	S-(R-Mt.)	6.83 lbs.	57.5 lbs.	5
7	C-Mt.	8. lbs.	56.5 lbs.	6
18	S-Mt.	8.21 lbs.	53.5 lbs.	7

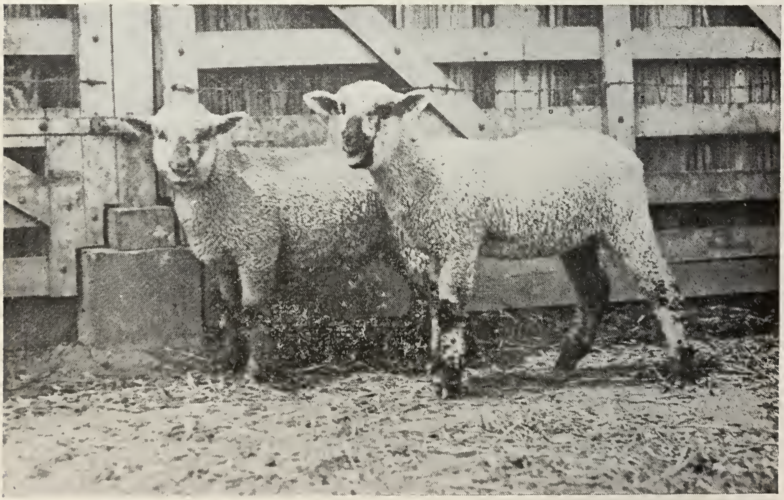

Fig. 23. Hampshire-Rambouillet-mountain lambs, sired by the Hampshire ram, out of a Rambouillet-mountain ewe, age 96 days. This cross does not reduce the length of leg, but it gives heavier lambs that are thicker than the mountain lambs. They gain very rapidly.

Three of the crosses were represented by only two lambs each, which is not a sufficient number to warrant definite conclusions as to their proper standing. The significant feature of this table is that the four leading crosses were all sired by the Hampshire ram, so that very probably the crosses represented by only two lambs each are approximately where they belong. Here, as before, there was no relationship between the birth weight and the final weight.

The H-(R-Mt.) lambs were lacking in uniformity of color. They had speckled faces and legs. They were upstanding and lacking in blockiness. Their faces, cheeks and legs were well covered with wool.

The H-(H-(R-Mt.) lambs showed more of the black color of the Hampshire, which gave the wool on top of the head a brown tinge. They were closer to the ground and had a fair covering of wool on the faces and legs.

The H-(H-Mt.) lambs showed many of the characteristics in color and markings of the Hampshire. The faces and legs

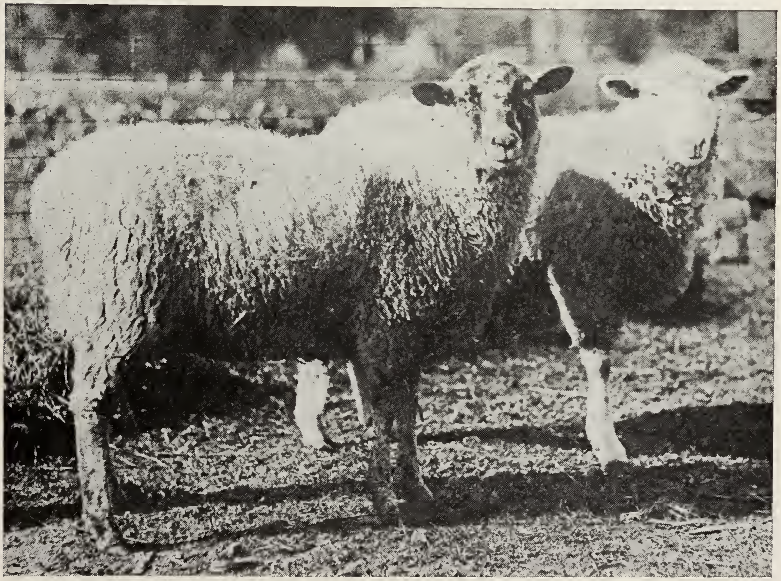

Fig. 24. Hampshire-Rambouillet-mountain yearling ewe and wether twins. The ewe proved to be an excellent breeder.

were of a uniform black color. The ears were large and heavy with the characteristic droop. Their bodies were much more smooth and compact and low-set than those of the first cross. One lamb had a covering of wool on the face and cheeks, while the wool on the others stopt at the eyes.

The H-Mt. lambs were leggy and loosely put together. The faces, legs and ears were either black or mottled.

The S-(R-Mt.) lambs were a little more leggy and rangy than were the S-Mt. lambs. Their color markings were mixed. They were well covered with medium dense wool over the face, cheeks, underline and legs.

The S-Mt. lambs were low-set, compact, blocky and smoothly built, more so than any of the other crosses. The color varied from light to dark gray. Most of them showed quite pronounced Southdown type. They were wooled down fairly well between the eyes, but had very little wool on the cheeks.

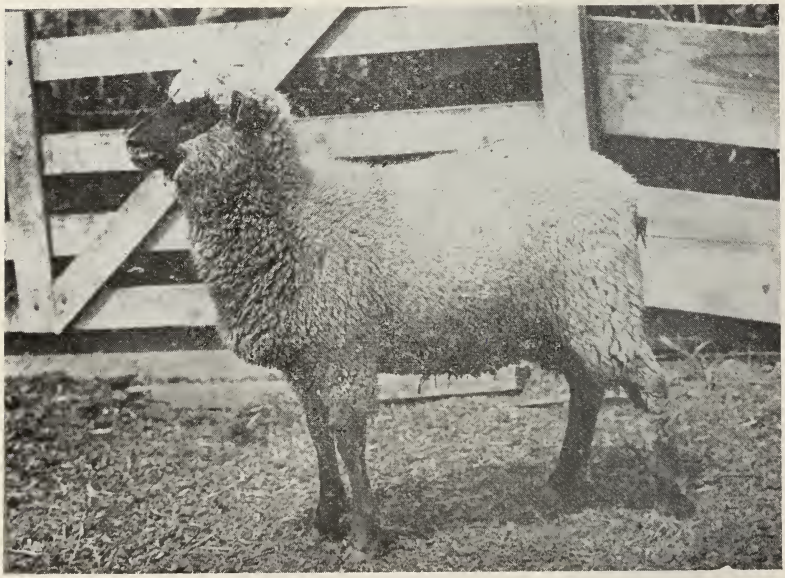

Fig. 25. Hampshire-Hampshire-Rambouillet-mountain wether lamb, sired by Hampshire ram, out of the brockle-face ewe shown in Fig. 24, age 5 months. As a market lamb this lamb is an improvement over the H-(R-Mt.) cross.

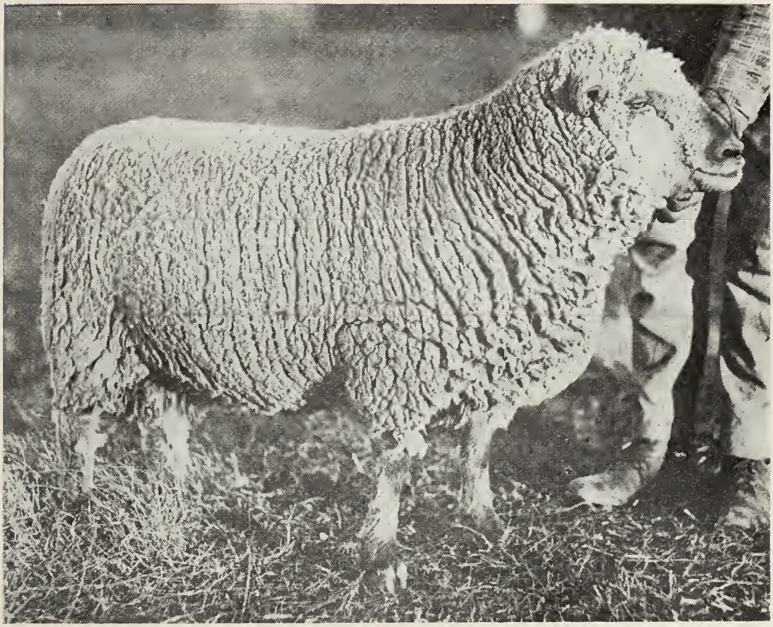

Fig. 26. First Southdown ram used. Two years old. He sired the largest lambs of any of the three Southdown rams used.

The C-Mt. lambs all appeared very much like the Cheviot. They had white faces, legs and ears, erect ears, and were alert in appearance. Their fleeces were open but of good length. A few of the wether lambs showed scurs, which were quite prominent in their sire.

Fifth Year, 1919-1920

The breeding season in 1919 began on September 16. Hampshire, Southdown and Cheviot rams were used. The rams were turned with the ewes on September 16 and were allowed to run with them continually for 40 days. The Hampshire ram proved to be very uncertain as a breeder, getting only two ewes with lamb.

Conditions during this year were very unsatisfactory. The sheep were too crowded and very little protein feed was available. The result was that a great many of the lambs came either weak or dead. The lambs sired by the Cheviot were more vigorous at birth and nursed more quickly than did the lambs of any other cross.

Table V gives the weights of the lambs at birth and at weaning time.

TABLE V

Weight of Lambs, Fifth Year, 1919-1920

No. of lambs	Breeding	Ave. wt. at birth	Ave. final wt. (age 140 days)	Rank
1	H-(H-(R-Mt.)	8.75 lbs.	74 lbs.	1
4	C-(R-Mt.)	7.92 lbs.	73.5 lbs.	2
1	S-(S-(R-Mt.)	8.00 lbs.	70 lbs.	3
5	C-Mt.	7 lbs.	66.5 lbs.	4
12	S-Mt.	6.82 lbs.	60 lbs.	5
2 (twins)	H-(H-Mt.)	5.25 lbs.	55 lbs.	6
4	S-(S-Mt.)	7.33 lbs.	52.5 lbs.	7
2 (twins)	S-(R-Mt.)	7 lbs.	46 lbs.	8

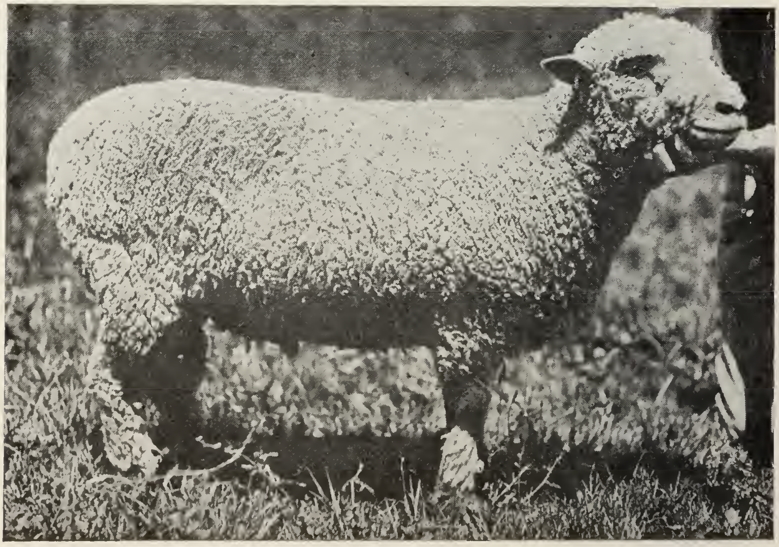

Fig. 27. Second Southdown ram used. Weight 102 pounds. The lambs sired by this ram were small.

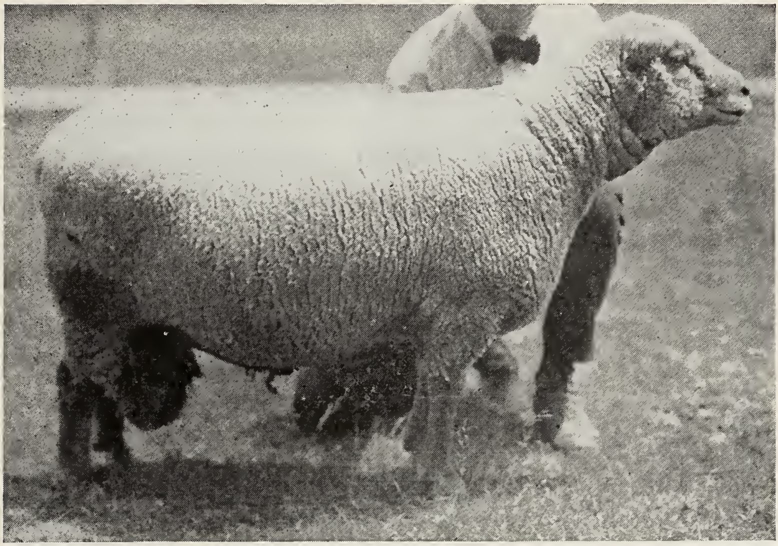

Fig. 28. Third Southdown ram used, four years old. Weight 175 pounds Second prize as a lamb at the Tennessee State Fair. His lambs had plenty of quality but lacked size.

The age of all the lambs at the last weighing was 140 days. One three-quarter Hampshire lamb, H-(H-(R-Mt.), led the list with a half pound more than the four Cheviot-Rambouillet-mountain lambs. One three-quarter Southdown, S-(S-(R-Mt.), a lamb of remarkable squareness and blockiness of build and with plenty of quality, ranked third, followed by the five Chev-

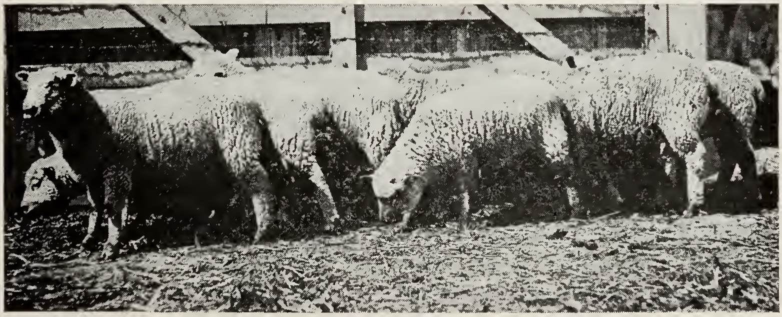

Fig. 29. Southdown-mountain lambs, age 107 days. Weight 57 pounds. They are much more uniform and more blocky than the mountain lambs. They are closer to the ground than the R.-Mt. or the H.-Mt. lambs.

iot-mountain lambs. Twelve Southdown-mountain lambs ranked fifth with an average of 60 pounds. Two Hampshire-Hampshire-mountain lambs were sixth, four Southdown-Southdown-mountain lambs seventh, and two Southdown-Rambouillet-mountain twins were at the bottom, twenty-eight pounds lighter per head than the leader. The nine grade Cheviot lambs ranked higher than did the seven grade Cheviots in 1919. The three grade Hampshire lambs ranked lower than did the seventeen grade Hampshires in 1919.

Sixth Year, 1920-1921

The breeding season in 1920 began on August 11. Hampshire, Southdown and Cheviot rams were used. The rams were allowed to remain with the ewes for forty-seven days. They

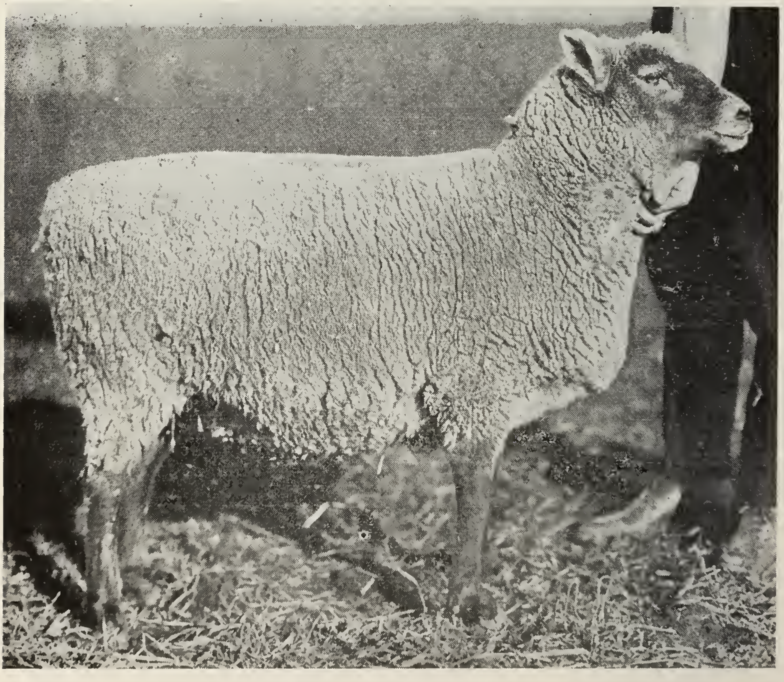

Fig. 30. Yearling Southdown-mountain wether. Weight 145 pounds. Dressed 64.4 per cent without a shrink. This wether fattened very easily. His head is small, short and wide and his body very thick, but he is peaked in the hind quarter. His legs are too long.

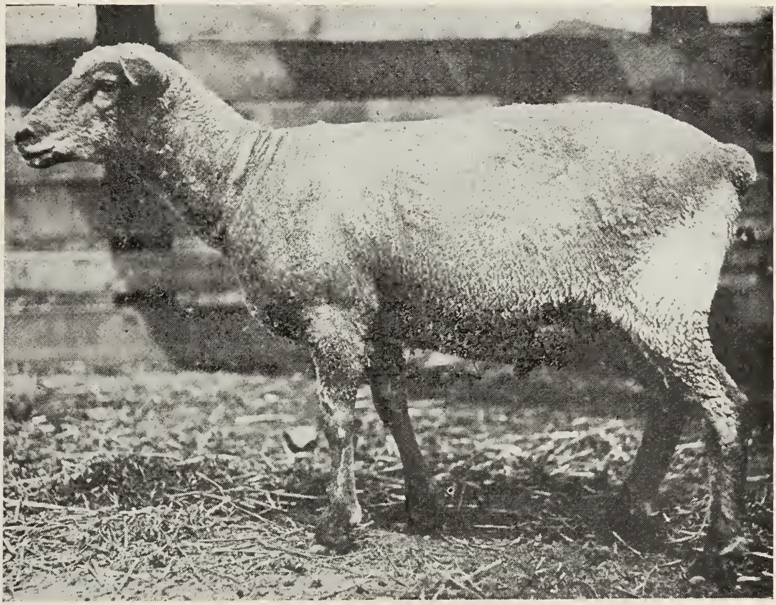

Fig. 31. Yearling Southdown-mountain wether, after shearing. Weight 110 pounds. This wether is more rangy than the one shown in Fig. 30. He is thickly covered with meat of good quality.

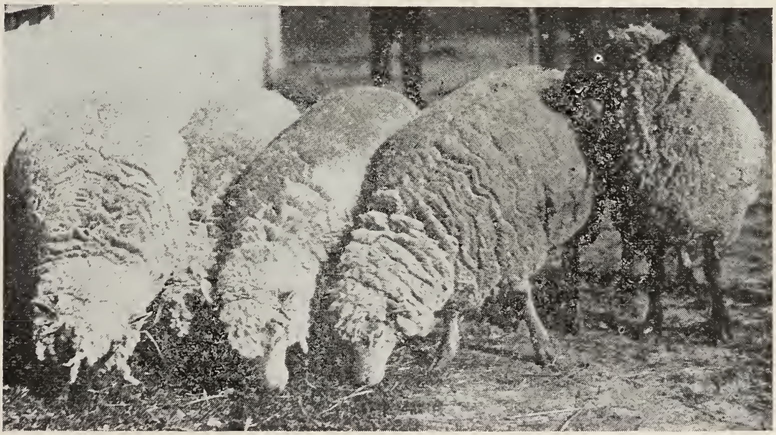

Fig. 32. Yearling Southdown-mountain ewes. Weight 100 pounds. Only a few of these ewes are larger than the mountain ewes. Their wool, however, is finer and denser.

were permitted to be with the ewes continuously during this time.

Table VI gives the weights of the lambs at birth and at weaning time.

TABLE VI

Weights of Lambs, Sixth Year, 1920-1921

No. of lambs	Breeding	Ave. wt. at birth	Ave. final weights (age 120 days).	Rank
1	H-Mt.	11.5 lbs.	100 lbs.	1
1	H-(H-(H-Mt.)	9.25 lbs.	81.5 lbs.	2
2 (twins)	H-(H-(R-Mt.)	8.0 lbs.	79 lbs.	3
4	H-(H-Mt.)	8.0 lbs.	70 lbs.	4
2	C-Mt.	10.25 lbs.	69 lbs.	5
5	C-(R-Mt.)	6.5 lbs.	66.5 lbs.	6
1	C-(C-Mt.)	7.25 lbs.	66 lbs.	7
4	S-(R-Mt.)	7.5 lbs.	64 lbs.	8
2 (twins)	S-(H-Mt.)	7.5 lbs.	63.5 lbs.	9
7	S-(S-Mt.)	7.5 lbs.	61.5 lbs.	10

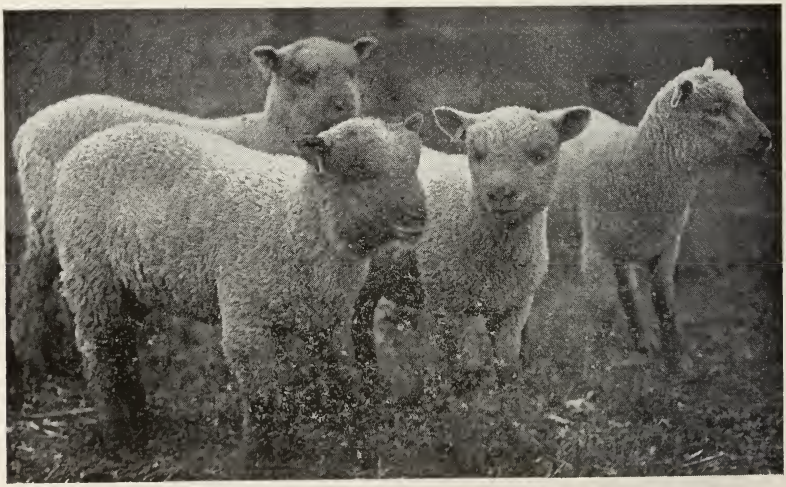

Fig. 33. Three-quarter Southdown lambs, sired by the Southdown ram, out of Southdown-mountain ewes.

The eight lambs in the four leading crosses were all sired by the Hampshire ram. This agrees with the figures given in Table IV, but the number of individuals represented here is small also. The heaviest lamb at birth was also the heaviest at 120 days of age but the remainder of the crosses show as much variaton as in any preceding year.

A half-blood Hampshire wether lamb ranked first, weighing 100 pounds, which was 18.5 pounds more than the weight of the seven-eights-blood Hampshire ewe lambs ranking second. The two lambs in the third place were twins, three-quarter-blood Hampshires with one Rambouillet cross. The four three-quarter-blood Hampshires which did not possess a Rambouillet cross were fourth, nine pounds lighter per head than those in third place. Only one other cross containing Hampshire blood was represented. Two twin lambs sired by the Southdown ram and out of a Hampshire-mountain ewe ranked ninth with a weight of 63.5 pounds.

The Cheviot and Southdown grades occupied the six bottom places. The Cheviot crosses ranked fifth, sixth and seventh, while the Southdown crosses ranked eighth, ninth and tenth.

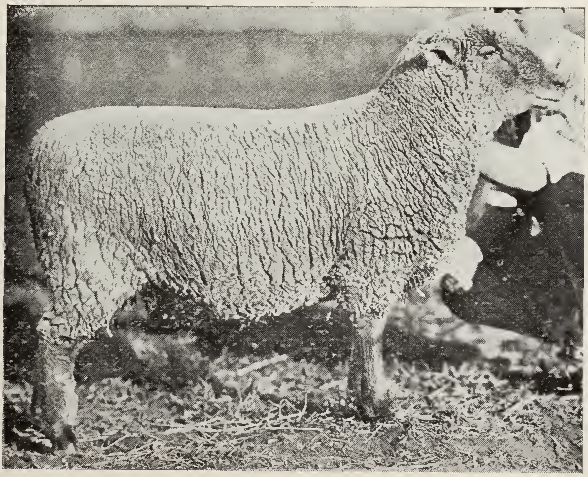

Fig. 34. Three-quarter Southdown yearling wether. Weight 135 pounds. He is closer to the ground and is more typically Southdown than the wethers shown in Figs. 30 and 31.

PERCENTAGE OF TWINS

Table VII shows the percentage of twins sired by rams of the different breeds.

TABLE VII

Breed of Ram	No. of lambs sired	No. of twin lambs	Percentage of twins	Rank
Hampshire	78	56	71.8	1
Cheviot	36	23	63.9	2
Southdown	102	45	44.1	3
Rambouillet	32	12	37.5	4
Mountain	19	6	31.5	5

The above figures cover the results of six years. They include not only lambs out of mountain ewes but also lambs out of

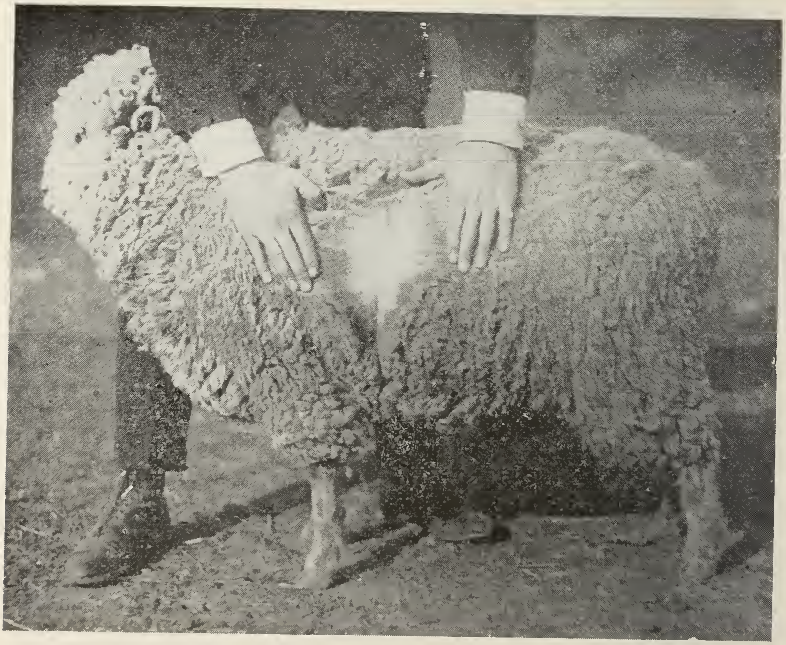

Fig. 35. Yearling Southdown-Rambouillet-mountain wether. This wether won third prize for the University of Kentucky in the carcass contest at the 1920 International Live Stock Exposition. He dressed 56.4 per cent without a shrink. His fleece weighed 9 pounds.

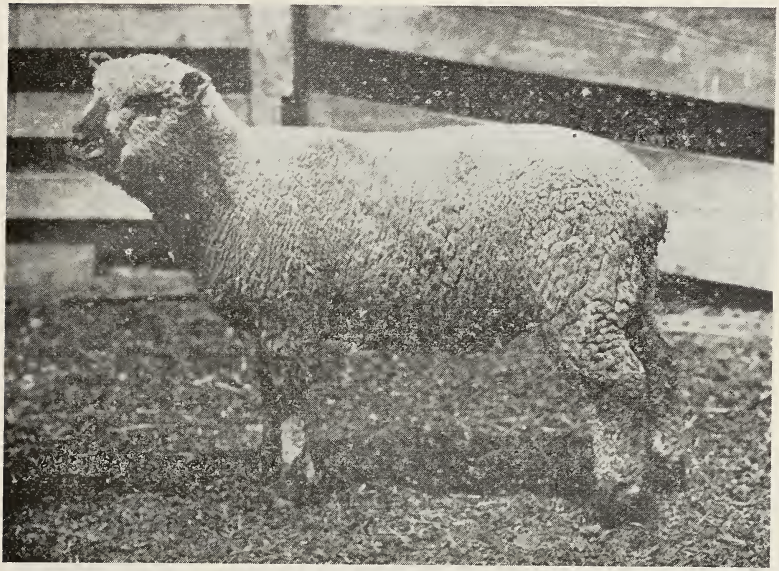

Fig. 36. Southdown-Southdown-Rambouillet-mountain wether lamb, out of a Southdown-Rambouillet-mountain ewe. Age 4½ months. A very compact small lamb.

grade ewes. The mountain ram, however, was bred only to mountain ewes.

The Hampshire ram sired the largest percentage of twins, followed in order by the Cheviot, Southdown, Rambouillet and mountain rams. While it may be desirable that sheep in the mountains should produce only a small percentage of twins, because of poor pastures and lack of proper handling facilities, yet for the production of spring lambs for market, especially in sections such as the Bluegrass region where grass and feed are plentiful, it is more profitable to produce a larger number of twins per ewe.

SLAUGHTER RECORDS

A few of the lambs were slaughtered in the meat laboratory. Unfortunately this laboratory was not in operation at the beginning of the experiment; consequently no records of the mountain lambs were obtained. However, records were kept of a few of the R-Mt., H-Mt. and S-Mt. lambs.

In every case the live weight, immediately before killing, was recorded. After the pelt, feet, head and viscera had been removed, the dressed carcass was weighed. The carcass was placed in the cooler where it remained for at least 24 hours in a temperature of from 33 to 37 degrees Fahrenheit. The carcass was then weighed again, this last weight being known as the cold dressed weight. This figure was used in determining the dressing percentage. The carcass shrank from one-half to two and one-half pounds during the process of cooling. The fatter carcasses shrank the less. Table VIII gives the slaughter records.

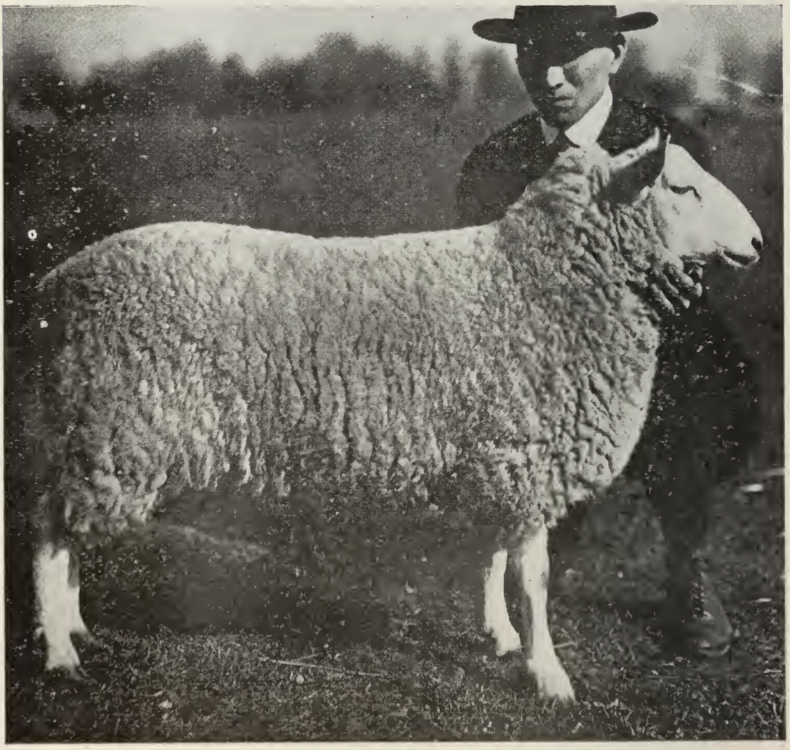

Fig. 37. Cheviot ram lamb, age 6 months. Weight when two years old, 145 pounds. He won fifth prize as a lamb at the Kentucky State Fair.

TABLE VIII

Slaughter Records

Breeding	Dressing Percentage	Percentage of marketable meat to weight of dressed carcass	Percentage weight of pelt to live weight
H-Mt.	50.15	89.98	12.25
S-Mt.	49.32	92.75	14.43
R-Mt.	48.70	92.99	19.73

All the carcasses were of good quality. There was an inverse relationship between the dressing percentage and the weight of the pelt. The H-Mt. lambs dressed the highest percentage and had the lightest pelts. The S-Mt. lambs were second in dressing percentage, with the second heaviest pelts, and the R-Mt. lambs were third with the lowest dressing percentage and the heaviest pelts. However, the percentage of marketable meat to the weight of the dressed carcass was greatest in the R-Mt lambs, second in the S-Mt. lambs, and least in the H-Mt. lambs. The marketable meat consisted of the carcass with the shanks, tail and kidney fat removed.

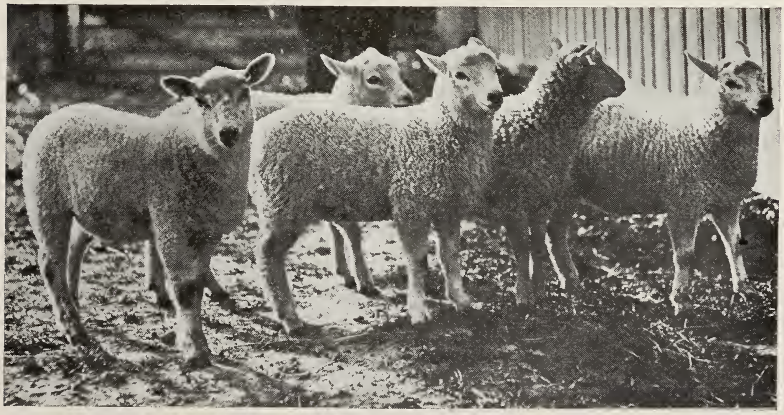

Fig. 38. Cheviot-mountain lambs, age 8 weeks. These lambs are very alert and hardy. They are much more uniform than the mountain lambs, and more thickly covered with meat of finer quality.

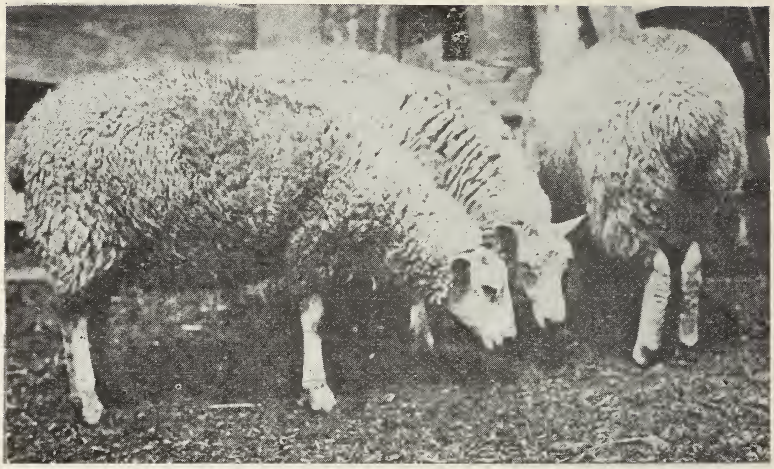

Fig. 39. Cheviot-mountain lambs, age 5 months. Their bone is clean and dense. Their wool is open and does not cover the head and legs as it does in the other crosses.

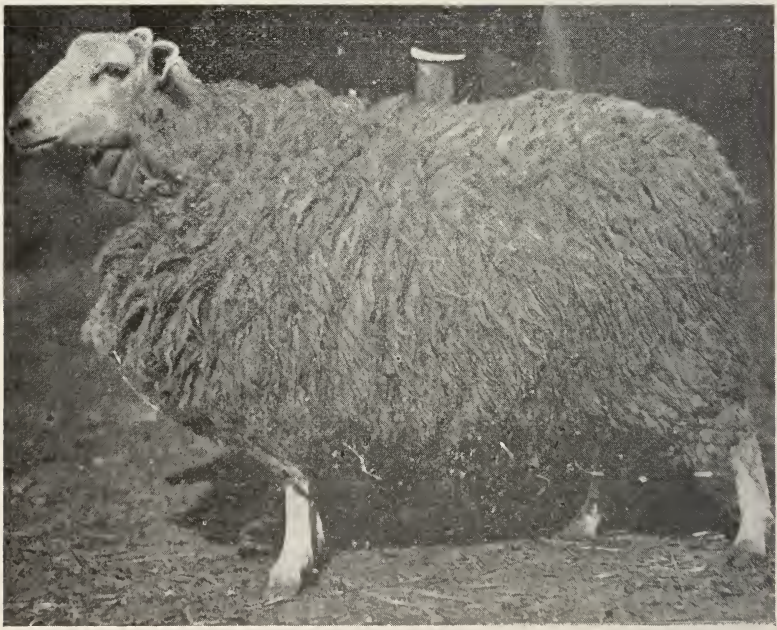

Fig. 40. Yearling Cheviot-mountain ewe. The fleece is coarse and long. Ewes of this breeding are very hardy.

Rambouillet Crosses

The Rambouillet ram transmitted his characteristics to his offspring more uniformly than did the rams of any other breed. The first-cross rams and ewes showed very pronounced Rambouillet characteristics. The hair on the face and legs usually was white, with sometimes a light tinge of brown, but never mottled. The fleeces were dense, compact and of good quality, grading three-eights and half-blood combing at the first shearing. After the first shearing, however, the wool was shorter, the class in the majority of cases changing from combing to clothing.

The general body formation was quite typical of the Rambouillet. The lambs showed a tendency to legginess and ranginess, which was not overcome as they matured. All the lambs showed a few wrinkles on the necks and the sides of the body. In some instances as the lambs matured all these wrinkles disappeared, while in others a slight dewlap or a small apron in front of the brisket remained.

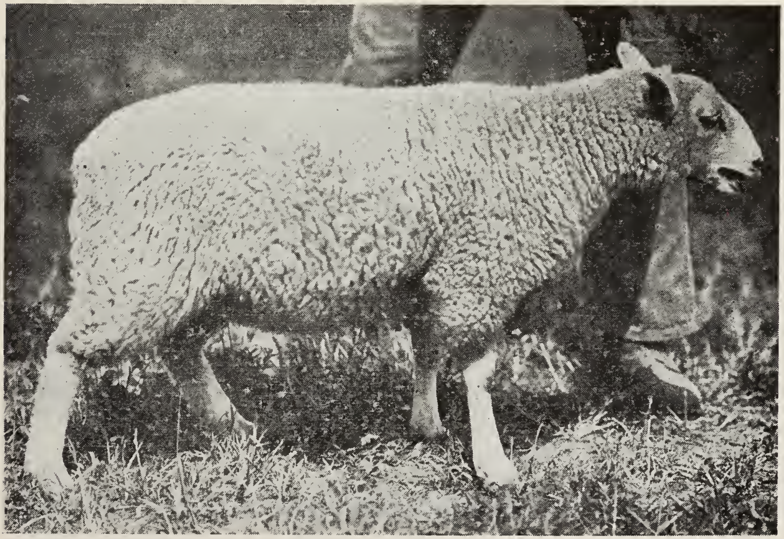

Fig. 41. Three-quarter Cheviot ewe lamb, sired by the Cheviot ram, out of the Cheviot-mountain ewe shown in Fig. 40. Her appearance is much more like that of the pure bred Cheviot. Her fleece is denser than that of her dam.

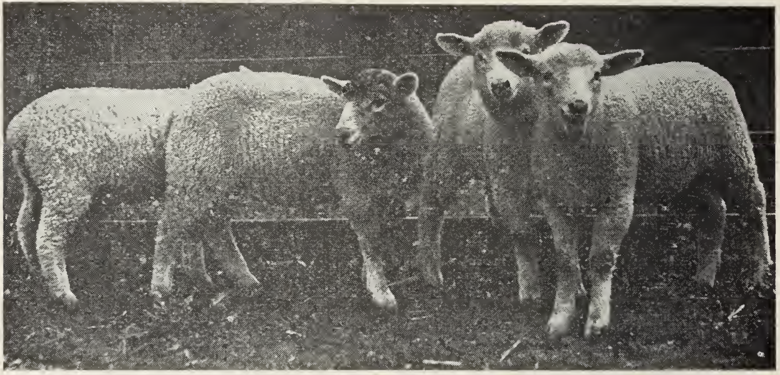

Fig. 42. Cheviot-Rambouillet-mountain lambs, age 8 weeks. These lambs grow more rapidly than those containing no Rambouillet blood.

The lambs of this cross were very hardy and vigorous. they gained rapidly. In two out of the three years in which the Rambouillet ram was used his lambs weighed more at weaning time than did any of the other crosses represented. In the third year, however, the lambs of this cross dropt to third place. The Rambouillet ram sired a smaller percentage of twins than the Hampshire, the Cheviot or the Southdown. (Figs 9-12.)

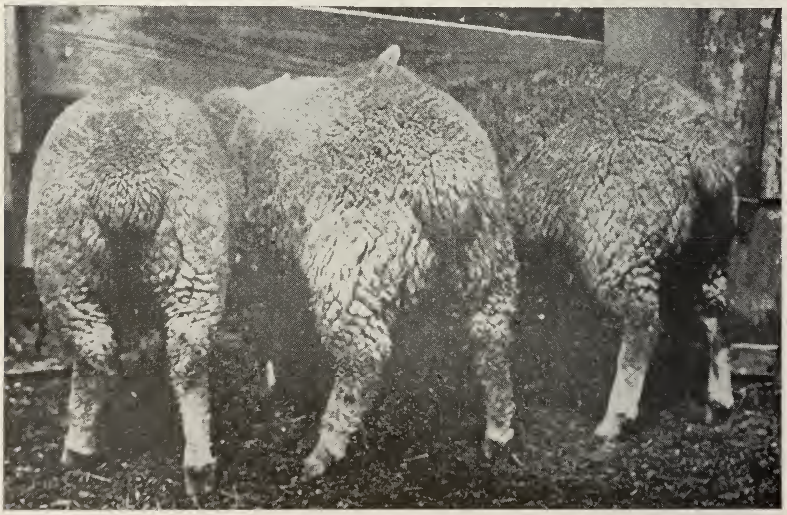

Fig. 43. Rear view of Cheviot-Rambouillet-mountain wether lambs. They have heavier, plumper legs-of-mutton than do the mountain lambs.

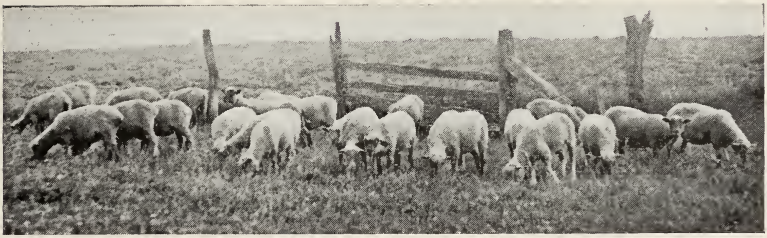

Fig. 44. Flock of grade Hampshire, Southdown and Rambouillet ewes, after shearing. Ewes of this type would be a credit to any farm. Compare with Figs. 2 and 3.

Hampshire Crosses

The Hampshire ram on the mountain ewe produced a larger proportion of twins than did any other cross. The lambs lacked uniformity in color markings, more so than those of any other cross. The faces and legs varied from mottled to solid

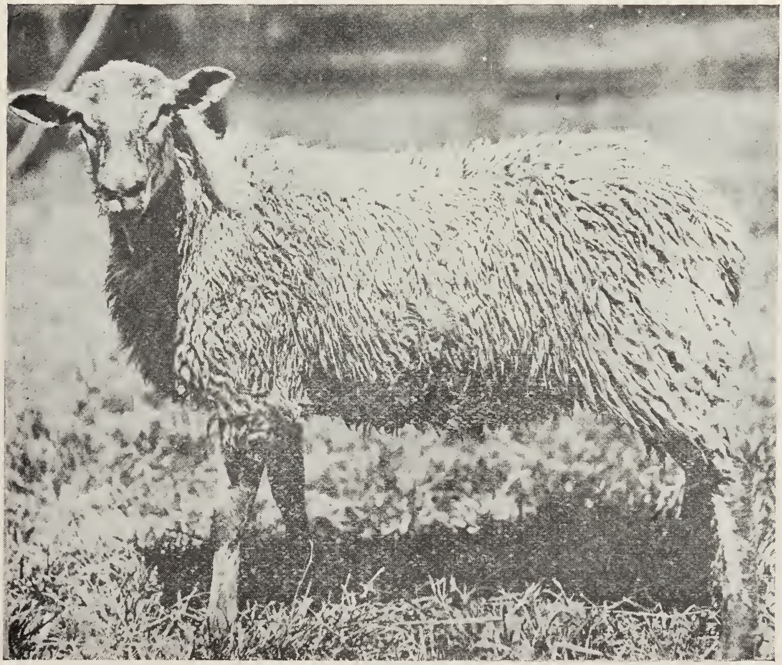

Fig. 45. Mountain lamb, before shearing. She is rangy; her legs are long; her body is shallow, and her wool coarse.

black. At birth a few of the lambs were black over their entire bodies, but their wool soon changed to white. The large head and large, drooping ear of the Hampshire were prominent characteristics.

As a whole, these lambs were somewhat leggy and rather loosely put together. They gained very rapidly and overcame to some extent their looseness of conformation as they grew older. (Figs 14-19: 48-50.)

The three-quarter Hampshires, H-(H-Mt.), showed very strongly the Hampshire characteristics. The body form, color and covering of wool were very typical. From the standpoint of the ideal market lamb they were a marked improvement over the half-blood Hampshires. (Fig. 20.)

The seven-eights Hampshires were again an improvement over the three-quarter bloods. Hampshire characteristics were very marked. (Figs, 21, 22.)

The Hampshire ram on the Rambouillet-mountain ewes produced lambs that gained more rapidly than did those out of the

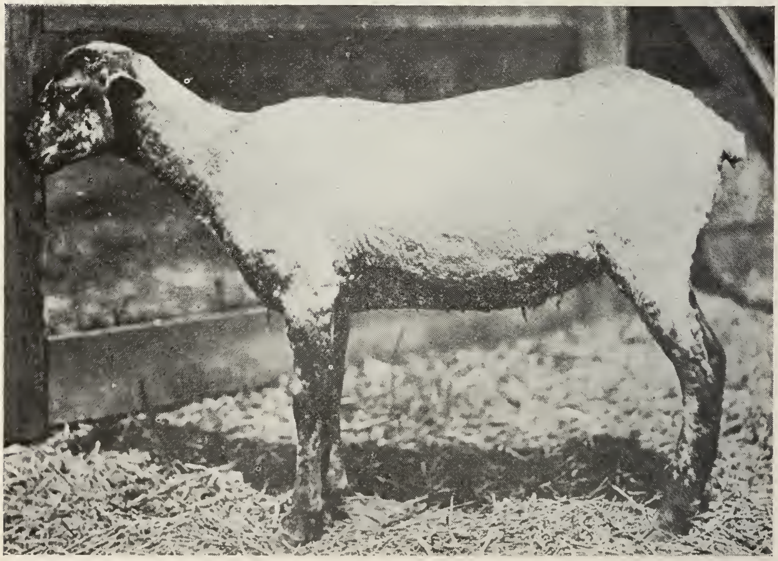

Fig. 46. Mountain lamb, after shearing. Her neck is long and thin; her back is swayed; her rump is short and steep; her legs are long, and she is thinly covered with flesh.

mountain ewes. They were a trifle more leggy, but were more compactly built and had much denser fleeces of finer quality. The face color ranged from solid white to solid black. (Figs. 23, 24.)

The ewes of the preceding cross, when bred to a Hampshire ram, produced three-quarter blood Hampshires that grew very rapidly. These lambs were much more uniform in color markings than were their dams, very little white appearing. The fleeces were a little more open, yet were more compact than those of lambs which contained no Rambouillet blood. (Fig 25.)

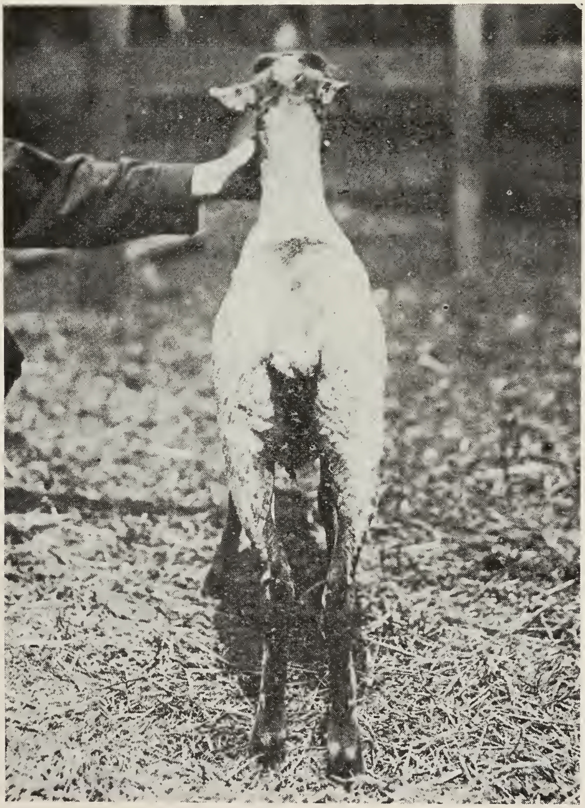

Fig. 47. Mountain lamb, after shearing. The body is extremely narrow; the leg-of-mutton is very light.

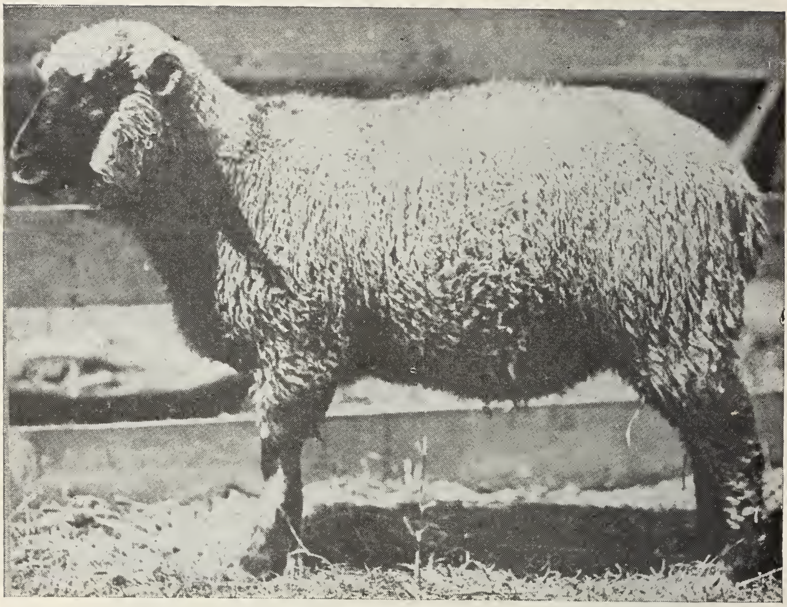

Fig. 48. Hampshire-mountain lamb, before shearing. This lamb is shorter, more compact and more blocky than the mountain lamb. His fleece is denser.

The Hampshire ram mated well with the mountain ewes. More satisfactory results were obtained, however, by first using the Rambouillet ram on the mountain ewe and then breeding the ewe lambs of that cross to the Hampshire ram.

Southdown Crosses

Quality was the outstanding characteristic of these lambs. They were not quite as hardy as the Rambouillet and Cheviot crosses. The color markings, as a rule, were very uniform, being mostly a greyish-brown, tho white markings and dark-brown faces sometimes occurred. The body form was quite typical of the Southdown. The lambs were low-set, blocky, squarely and compactly built, with smooth shoulders and large, plump legs. The wool was short, and coarser than that of the purebred Southdown. (Figs. 29-32; 51-53.)

The three-quarter blood Southdowns, S-(S-Mt.), showed Southdown characteristics more strongly. They were more uniform in their color markings and were more smoothly turned thruout. (Figs. 33, 34.) The Southdown on the Rambouillet-mountain ewes produced lambs that were small and well covered with a short fleece of fine quality. The faces and legs were a mottled gray in color. From the standpoint of growth this did not prove to be a good cross. The lambs, however, had excellent quality. The Department of Animal Husbandry showed a yearling wether of this breeding in the carcass contest at the 1920 Internatonal Live Stock Exposition. In a class of 23 yearlings this wether won third prize. He was the lightest yearling in the class, weighing only 117 pounds. Without a shrink he dressed 56.4 per cent. His carcass sold for 29 cents a pound. (Fig 35.) Lambs of this cross had plenty of quality but lacked growthiness.

Ewes of the above breeding when bred to Southdown rams produced three-quarter Southdowns, S-(S-(R-Mt.), which were

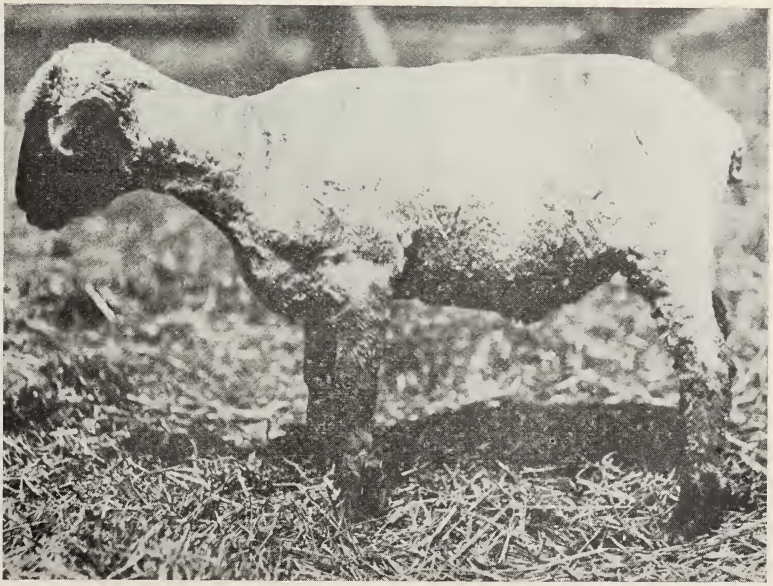

Fig. 49. Hampshire-mountain lamb, after shearing. His neck is thicker and shorter than that of the mountain lamb; his lines are straighter; his body is deeper, and he is more thickly covered with meat.

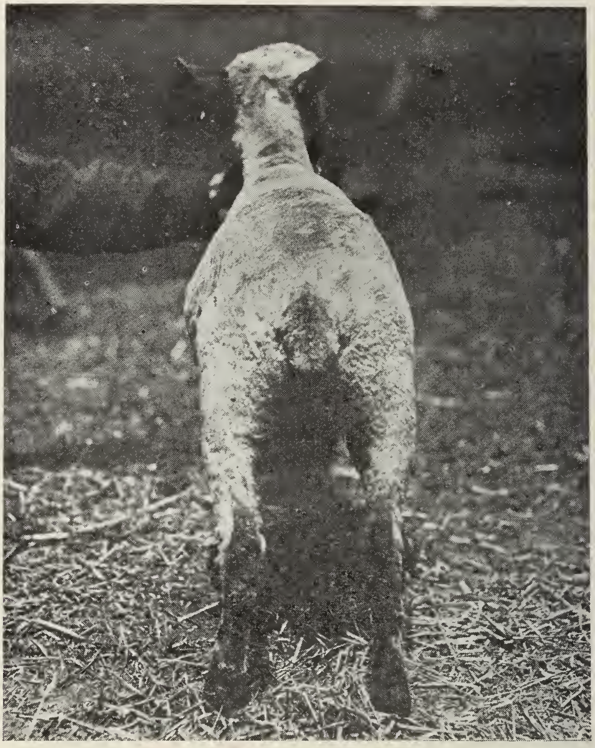

Fig. 50. Hampshire-mountain lamb, after shearing. His body is much thicker than that of the mountain lamb. His leg-of-mutton is much deeper and plumper.

more typically Southdown than were their dams. They had dark grayish-brown faces, were well covered with short, dense fleeces and were very smoothly turned. (Fig. 36.)

Cheviot Crosses

Vigor and activity were outstanding characteristics of the Cheviot crosses. The markings of the Cheviot were very evident. The faces and legs were white, with occasionally a few black spots. The fleeces were very much like those of the purebred Cheviot, but were perhaps just a trifle more open. In body form they were somewhat sharp on the top of the shoulder, but were thick and meaty, and remarkably straight on top. Pink noses occurred very frequently. (Figs 38-40; 54-56.)

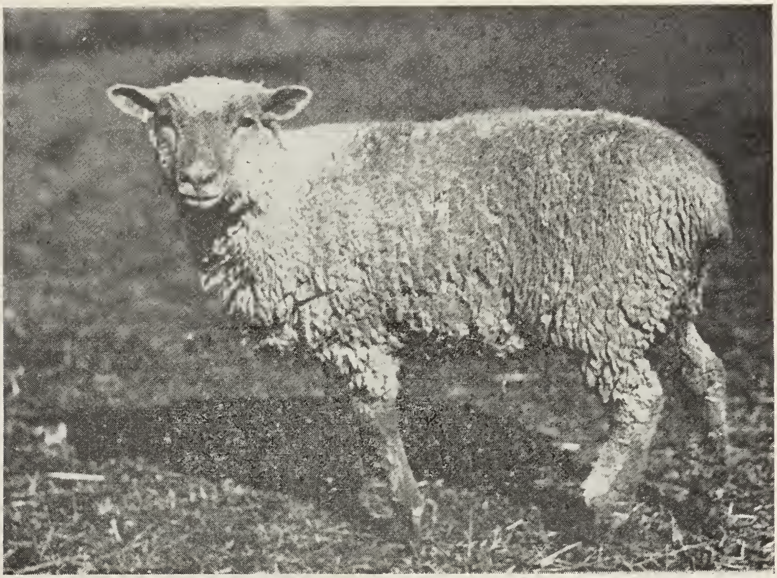

Fig. 51. Southdown-mountain lamb, before shearing. This lamb is much more blocky and low-set than the mountain lamb. Her fleece is much denser.

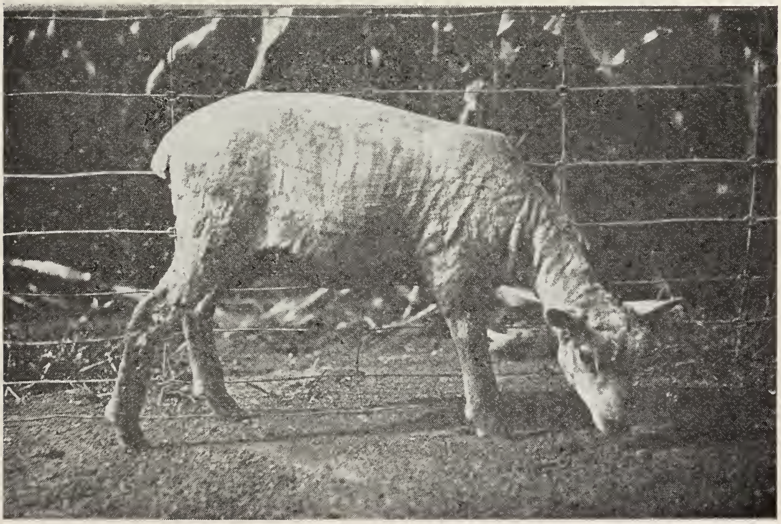

Fig. 52. Southdown-mountain lamb, after shearing. A much smoother, more evenly turned, more blocky lamb than the mountain lamb.

The three-quarter Cheviots, C-(C-Mt.), were more alert and stylish than were the half-bloods. Their ears were smaller and more erect. They were more meaty and more compactly built. (Fig. 41.)

The Cheviot ram bred to the Rambouillet-mountain ewes gave extremely rapid gaining lambs that were somewhat coarse but meaty. Their faces and legs were white. The wool extended somewhat over the sides of the face, was long, and of finer quality than that of the purebred Cheviot. (Figs. 42, 43.)

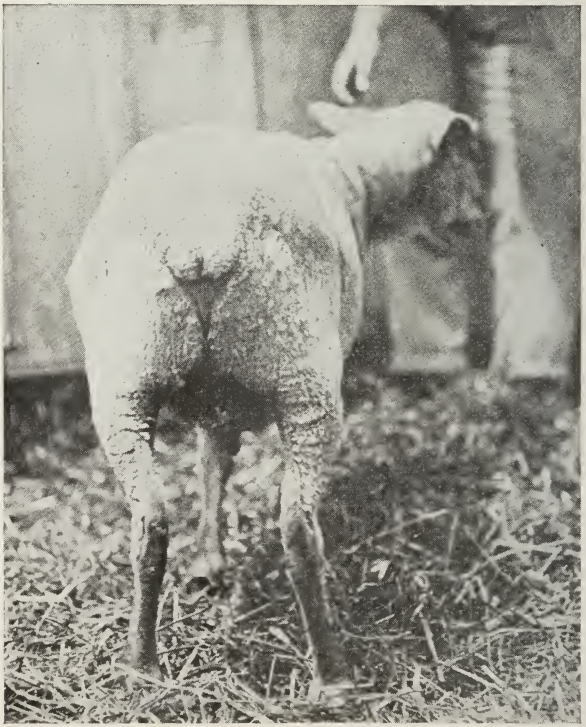

Fig. 53. Southdown-mountain yearling wether, after shearing. His leg-of-mutton is shallow, but it is plump and full.

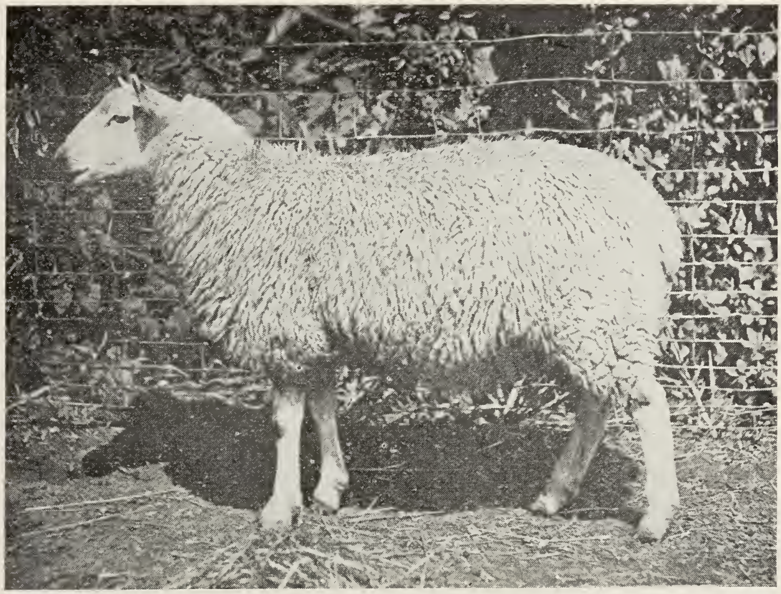

Fig. 54. Cheviot-mountain lamb, before shearing. This lamb is closer to the ground and is more blocky than the mountain lamb. The fleece is slightly more compact than that of the mountain lamb, but is more open than that of the Hampshire or Southdown cross.

Part II.

WOOL

The ewes used in this experiment possesst the light, open fleeces typical of the native mountain sheep. Their wool graded in the majority of cases as quarter and low quarter combing. A lack of wool extension over the face, legs and underline was predominant.

Eight of the mountain ewes were bare along the underline, four showed a light or medium covering, and eighteen were rather well covered. (Figs. 57, 65.)

In each of the six years shearing took place between April 15 and June 1, depending somewhat upon the season.

The following tables show the average weights and grades of the wool from the different crosses:

TABLE IX

Weight and Grade of Wool—Mountain

Year	Number of sheep	Ave. wt. of fleece	Grade
1916	31	5.00 lbs.	¼ and low ¼ combing and clothing
1917	28	5.43 lbs.	¼ and low ¼ combing and clothing
1918	27	5.08 lbs.	¼ and low ¼ combing and clothing
1919	27	4.98 lbs.	¼ and low ¼ combing and clothing
1920	22	3.98 lbs.	¼ and low ¼ combing and clothing
1921	9	6.00 lbs.	¼ and low ¼ combing and clothing
Ave.		5.00 lbs.	¼ and low ¼ combing and clothing

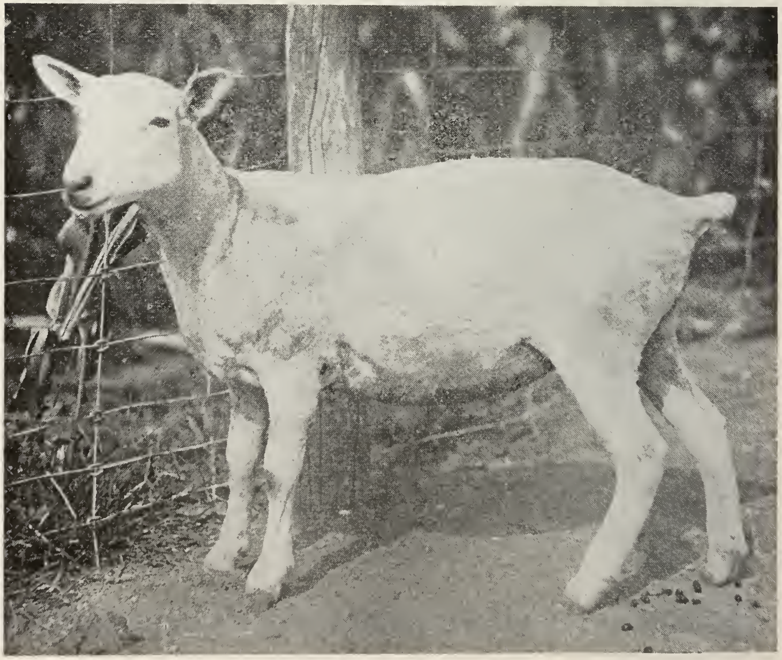

Fig. 55. Cheviot-mountain lamb, after shearing. The body is much deeper, more compact and more symmetrical than that of the mountain lamb. The hindquarters should be more heavily developt.

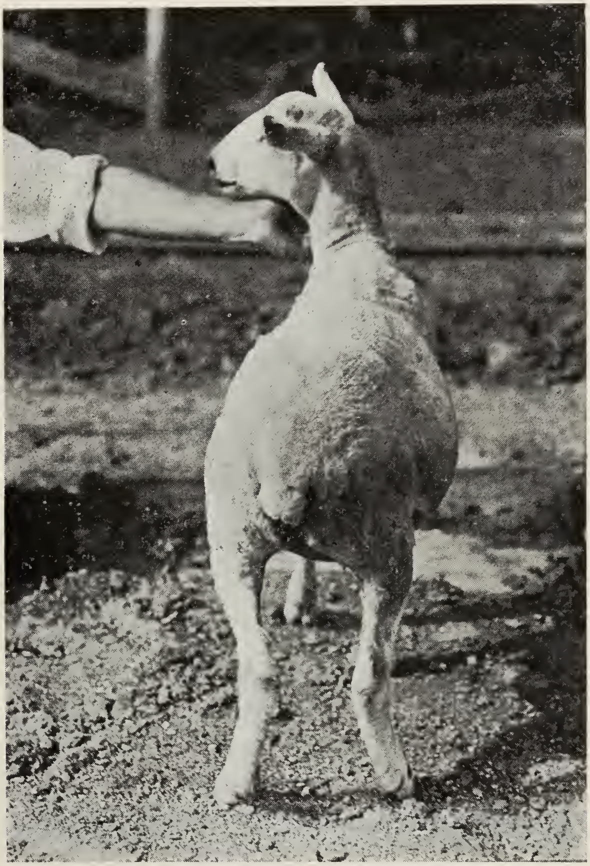

Fig. 56. Cheviot-mountain lamb, after shearing. The body is much thicker than that of the mountain lamb. The leg-of-mutton is plump but lacks depth.

TABLE X

Weight and Grade of Wool—Hampshire-Mountain (Figs. 59, 66)

Year	Number of sheep	Ave. wt. of fleece	Grade
1917	1	9 lbs.	¼ and ⅜ combing
1918	8	5.87 lbs.	¼ and ⅜ combing
1919	9	6.63 lbs.	¼ and ⅜ combing
1920	7	5.37 lbs.	¼ and ⅜ combing
1921	5	6.6 lbs.	¼ and ⅜ combing
Average		6.2 lbs.	¼ and ⅜ combing

TABLE XI

Weight and Grade of Wool—Rambouillet-Mountain (Figs. 58, 68)

Year	Number of sheep	Ave. wt. of fleece	Grade
1917	7	8.14 lbs.	⅜ and ½ blood combing and clothing
1918	5	7.90 lbs.	⅜ and ½ blood combing and clothing
1919	12	7.57 lbs.	⅜ and ½ blood combing and clothing
1920	13	6.05 lbs.	⅜ and ½ blood combing and clothing
1921	12	8.54 lbs.	⅜ and ½ blood combing and clothing
Average		7.52 lbs.	⅜ and ½ blood combing and clothing

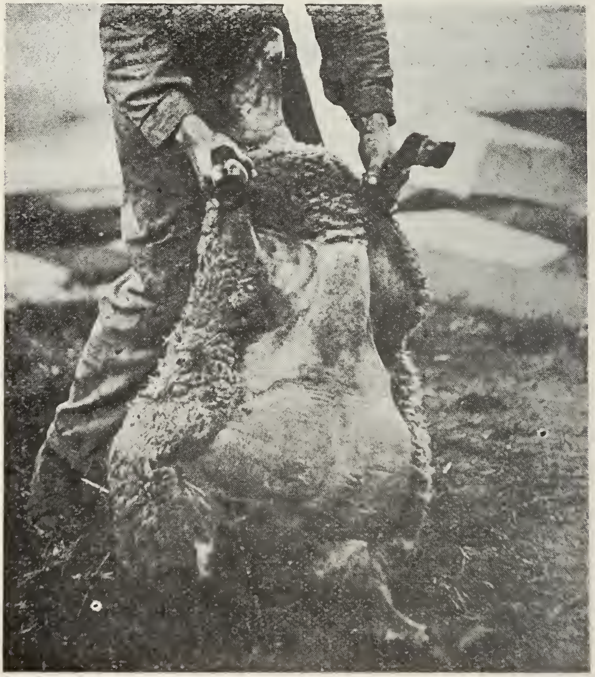

Fig. 57. Mountain ewe. Bare underline. Compare with Figs. 58, 59, 60 and 61.

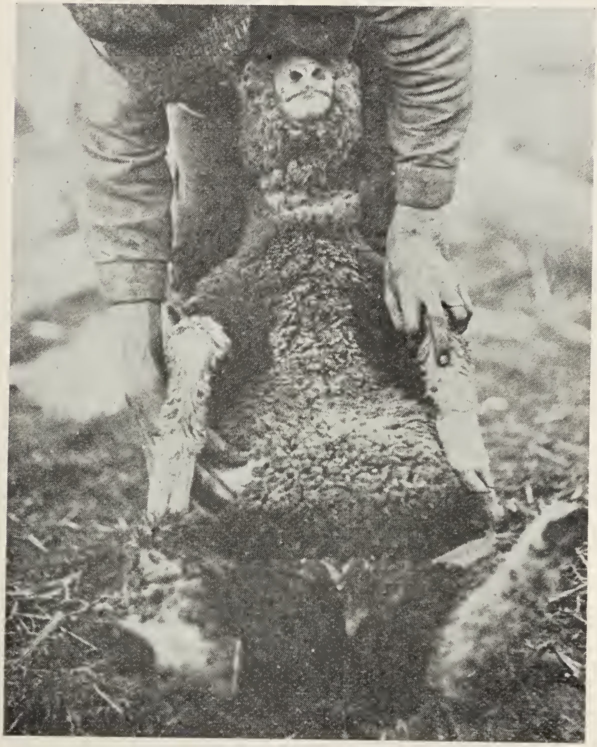

Fig. 58. Rambouillet-mountain ewe. Well covered on legs and underline. Compare with Fig. 57.

TABLE XII

Weight and Grade of Wool—Southdown-Mountain (Figs. 60, 67)

Year	Number of sheep	Ave. wt. of fleece	Grade
1919	8	6.94 lbs.	¼ and ⅜ combing and clothing
1920	9	4.78 lbs.	¼ and ⅜ combing and clothing
1921	15	6.36 lbs.	¼ and ⅜ combing and clothing
Average		6.06 lbs.	¼ and ⅜ combing and clothing

TABLE XIII

Weight and Grade of Wool

Hampshire-Rambouillet-Mountain (Fig. 69)

Year	Number of sheep	Ave. wt. of fleece	Grade
1919	4	7.56 lbs.	¼ and ⅜ blood combing
1920	4	5.93 lbs.	¼ and ⅜ blood combing
1921	4	7.75 lbs.	¼ and ⅜ blood combing
Average		7.08 lbs.	¼ and ⅜ blood combing

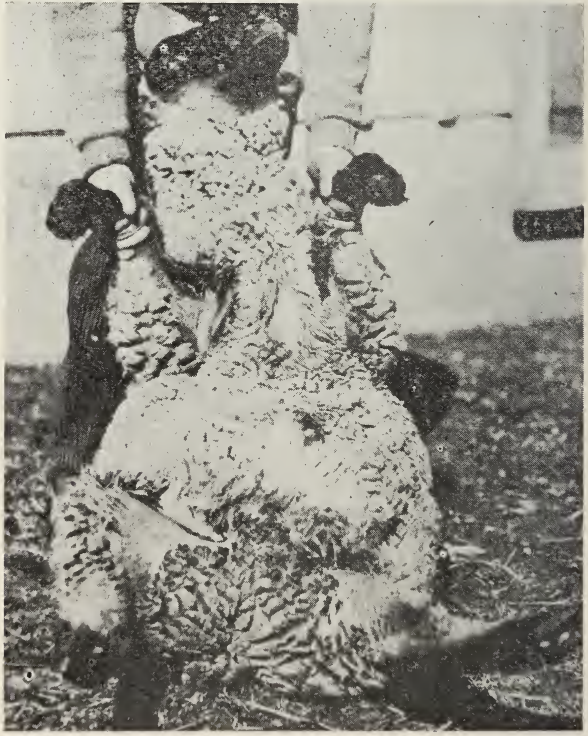

Fig. 59. Hampshire-mountain ewe. Well covered on legs and underline. Compare with Fig. 57.

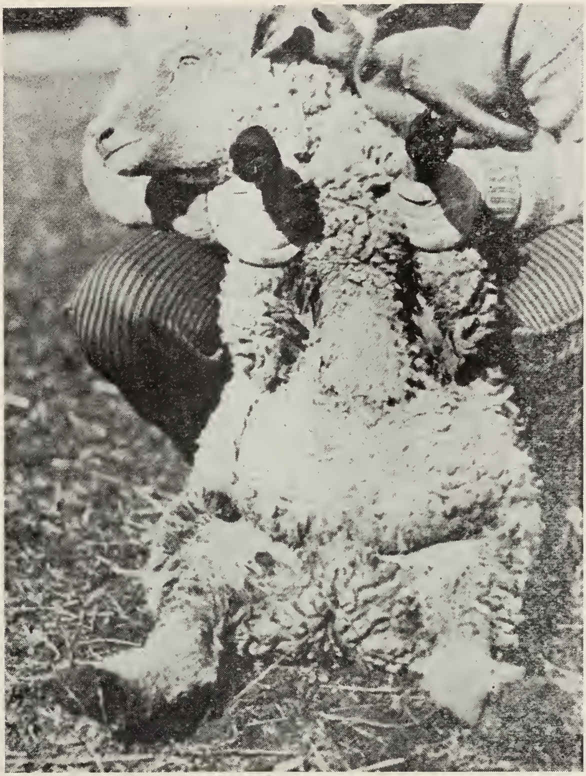

Fig. 60. Southdown-mountain ewe. Well covered on legs and underline. Compare with Fig. 57.

TABLE XIV

Weight and Grade of Wool
Southdown-Rambouillet-Mountain

Year	Number of sheep	Ave. wt. of fleece	Grade
1919	1	5.5 lbs.	⅜ combing
1920	2	6.1 lbs.	½ clothing ⅜ combing
1921	3	5.58 lbs.	⅜ clothing ½ combing
Average		5.74 lbs.	⅜ and ½ combing and clothing

TABLE XV.

Weight and Grade of Wool—Cheviot-Mountain

Year	Number of sheep	Ave. wt. of fleece	Grade
1920	1	6 lbs.	¼ combing
1921	3	6 lbs.	¼ and ⅜ combing
Average		6 lbs.	¼ and ⅜ combing

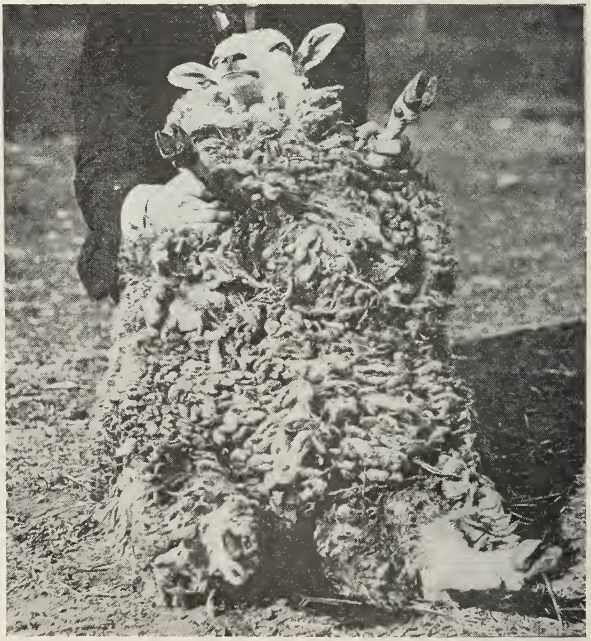

Fig. 61. Cheviot-mountain ewe. Well covered on underline. Clean legs and head. Compare with Fig. 57. The extension of wool in this cross is less than in any other cross.

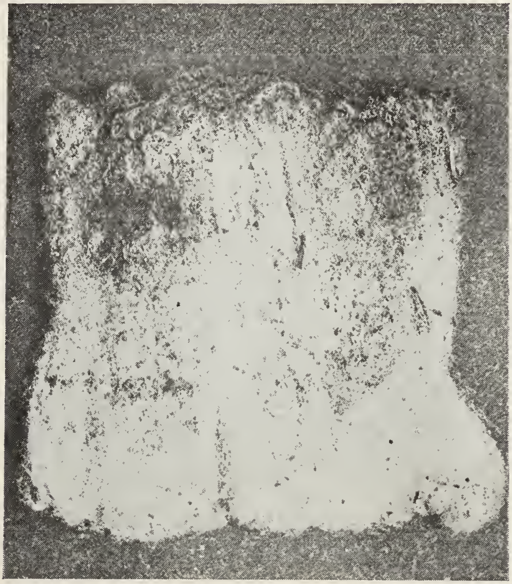

Fig. 62. Wool from the Rambouillet ram, natural size.

TABLE XVI

Summary

Weights and Grades of Wool

Breeding	Ave. Wt. of fleece	Grade
R-Mt.	7.52 lbs.	⅜ and ½ combing and clothing
H-(R-Mt).	7.08 lbs.	¼ and ⅜ combing and clothing
H-Mt.	6.2 lbs.	¼ and ⅜ combing
S-Mt.	6.06 lbs.	¼ and ⅜ combing and clothing
C-Mt.	6.00 lbs.	¼ and ⅜ combing
S-(R-Mt.)	5.74 lbs.	⅜ and ½ combing and clothing
Mt.	5.00 lbs.	¼ and low ¼ combing and clothing

Altho the sheep were sheared each year between April 15 and June 1, there was quite a variation in the weights of the fleeces from one year to the next. During the six years covered by this experiment the average weights of the fleeces from the mountain sheep varied from 3.98 pounds to 6 pounds. One reason for this weight of 6 pounds in 1921 was that the ewes were culled in the summer of 1920 and only nine of the best mountain ewes were kept in the flock. It is seen from the tables that five out of the seven crosses represented produced more wool in 1921 than in 1920; that one produced the same, and that one produced less. During the winter of 1919-1920 very little clover hay or protein feed of any kind was fed to the ewes and they came thru the winter in rather thin condition. In fact, some of them lost weight. During the winter of 1920-1921 plenty of clover hay was available at all times and the ewes came thru in excellent shape, every ewe making a good gain.

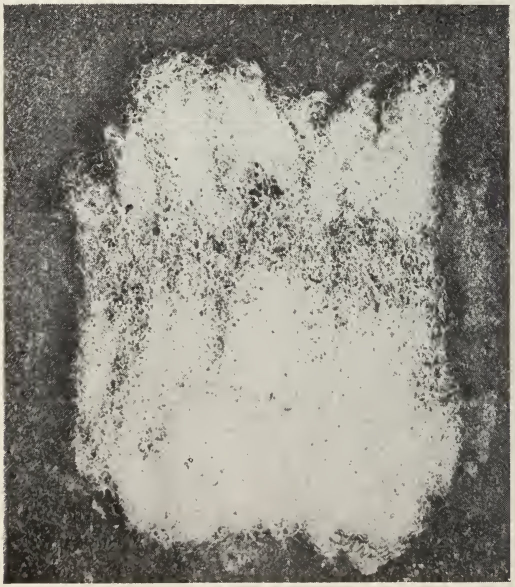

Fig. 63. Wool from the Southdown ram, natural size.

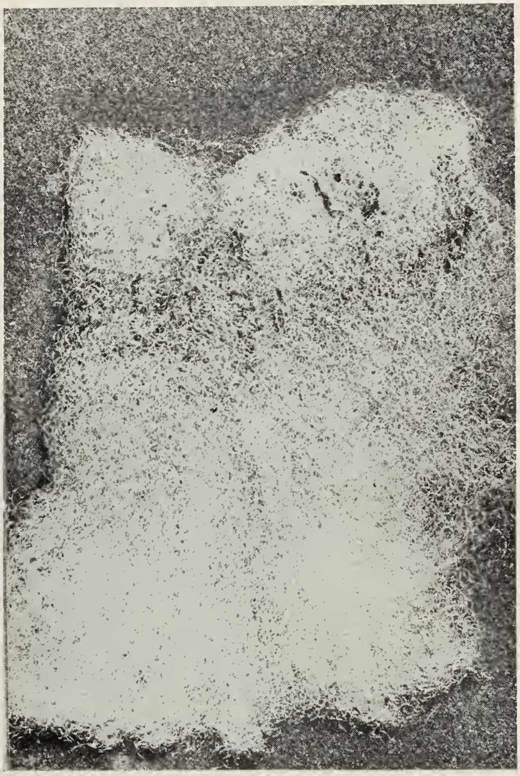

Fig. 64. Wool from the Hampshire ram, natural size.

These results indicate that feeding is an important factor in determining the weight of the fleece.

Table XVI shows that the fleeces from the mountain sheep weighed less and graded lower than those of any of the crosses. With but two exceptions this was true during every year of the experiment. In 1921 the average weight of wool produced by nine mountain ewes was the same as that of the three C-Mt. ewes and was .42 pound more than that of the three S-(R-Mt.) ewes. This was because the mountain ewes were culled in 1920 and only the best nine ewes were kept, whereas no attempt had been made to cull the C-Mt. and the S-(R-Mt.) ewes.

The wool from the R-Mt. and the S-(R-Mt.) ewes was sufficiently long at the first shearing to be classed as combing (2½ inches or more in length) but at each of the succeeding shearings the majority of the fleeces were shorter than 2½ inches and therefore were of clothing length. Figure 35 shows the fleece of a yearling S-(R-Mt.) wether. This fleece was five inches in length and graded high three-eights combing. Commercially, it was the most desirable fleece produced by any sheep during the six years of the experiment. This is the same wether which was mentioned as having won third prize in the yearling wether class in the carcass contest at the 1920 International Live Stock Exposition.

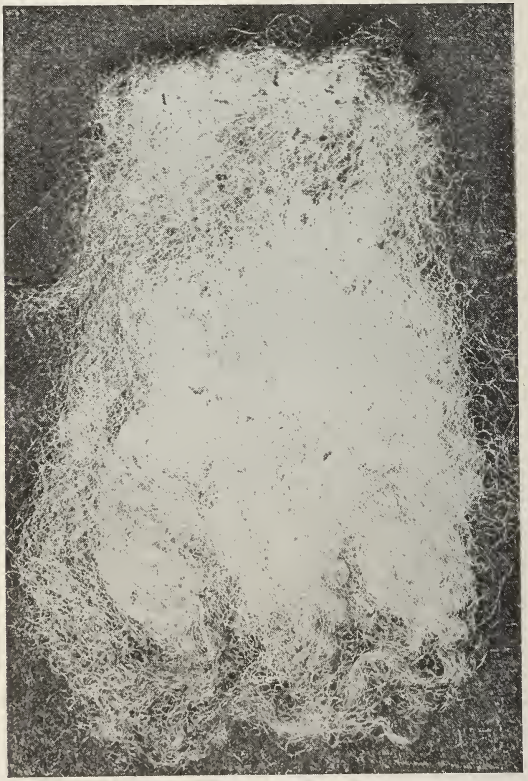

Fig. 65. Wool from a mountain ewe, natural size. This fleece is coarser than any of the crosses.

The Hampshire and Cheviot crosses produced coarser wool than that of the Southdown and Rambouillet crosses, but it was longer and very seldom was classed as clothing in length. Practically thirty per cent of the S-Mt. wool was of clothing length after the first shearing.

Fig. 66. Wool from a Hampshire-mountain ewe, natural size. It is longer, finer and heavier than that from the mountain ewe.

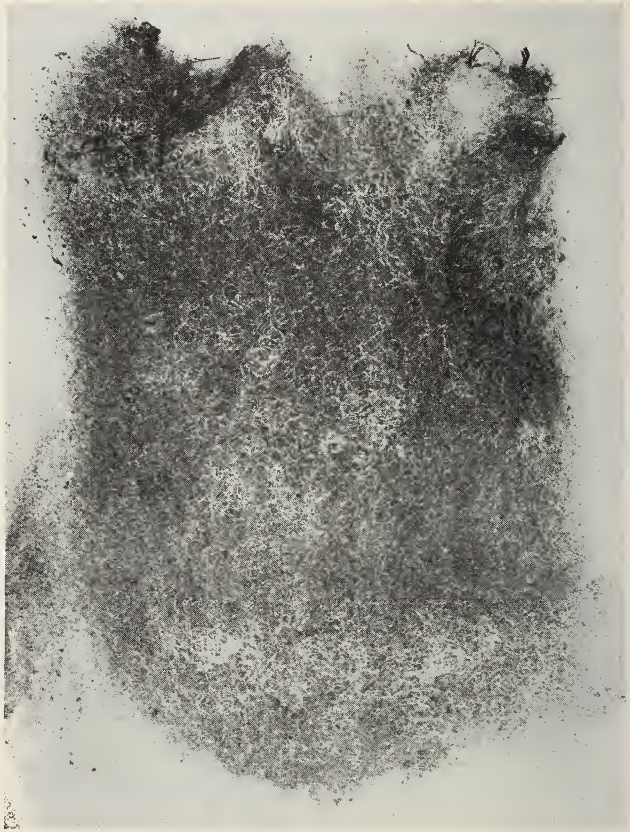

Fig. 67. Wool from a Southdown-mountain ewe, natural size. It is finer and heavier than that from the mountain ewe, but not as long.

SUMMARY AND CONCLUSIONS

1. The Rambouillet should be given careful consideration by Kentucky sheep men when considering the blood to choose in building up farm flocks. This was found to be the most satisfactory cross for improving the mountain ewes. The ewe lambs saved from this cross gained rapidly and developt into ewes possessing to a greater extent than any other cross the hardiness, the prolificacy, the early breeding and the mothering and milking qualities of the mountain ewes. They produced heavier, finer and more valuable

fleeces. When bred to purebred mutton rams they produced market lambs of better quality and type than the lambs from the mountain ewes.

2. The grade Hampshire lambs gained rapidly and were ready for market at an earlier age than any others. They lacked the quality of the Southdown and Cheviot grades. The grade Hampshire ewes had plenty of size and were good mothers.

3. The Southdown grades possesst excellent quality and good mutton form, but they gained slowly and required a longer time to reach marketable weight than the grade Hampshires, Cheviots and Rambouillets. The grade Southdown ewes were too small.

Fig. 68. Wool from a Rambouillet-mountain ewe. Much finer and heavier than that from the mountain ewe or any other cross, but shorter.

4. The Cheviot grades grew more rapidly than the Southdown grades. They had finer quality than the Hampshire and Rambouillet grades. The grade Cheviot ewes were vigorous and were good mothers. They were very similar to the mountain sheep in appearance.

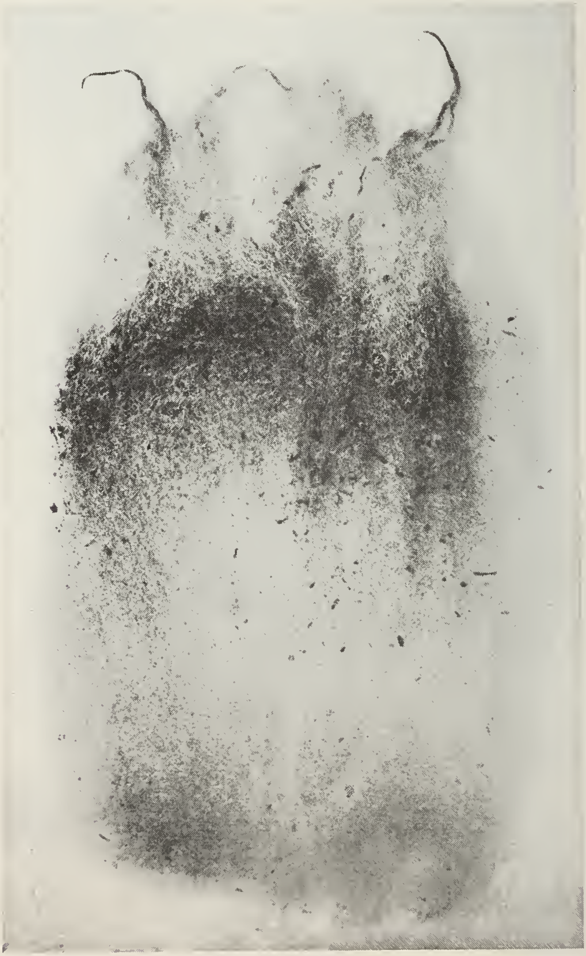

Fig. 69. Wool from a Hampshire-Rambouillet-mountain ewe. This wool is longer, finer and heavier than that of the mountain ewe; finer and heavier than that of the H.-Mt. cross; longer, coarser and lighter than that of the R.-Mt. cross. Commercially it is a very desirable type of wool.

5. The average mountain ewe produced 5 pounds of low-grade wool. The purebred rams increased the weight of the fleece .74 pound to 2.52 pounds and in practically every instance improved the quality.
6. Rams of the four breeds used sired lambs that were more meaty, grew more rapidly, were of finer quality, and dressed out a higher percentage than lambs sired by scrub rams.
7. Lambs sired by the purebred rams topped the Louisville and Cincinnati markets. The largest lambs, therefore, returned the most money per head.
8. The Hampshire ram sired a larger percentage of twins than any of the other rams. The Cheviot ranked second, Southdown third, Rambouillet fourth, and mountain last.

Acknowledgments

Acknowledgments for assistance in this work are due to Mark J. Smith, L. B. Mann and T. G. Yaxis, all of whom formerly were members of the Animal Husbandry Department.

B

Kentucky
Agricultural Experiment Station

University of Kentucky

STERILITY IN RELATION TO ANIMAL BREEDING

BULLETIN NO. 244

(Research Bulletin)

Lexington, Ky.

December, 1922

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BULLETIN NO. 244

(Research Bulletin)

Sterility in Relation to Animal Breeding

BY W. S. ANDERSON

INTRODUCTION

In building the breeds of domestic live stock almost all breeders have had the progress of their work retarded by sterility. Breeders have not only seen some of their best animals cast off as worthless because of sterility but they have seen an entire bloodline of a breed disappear because of the prevalence of sterile animals in the strain.

Sterility is met in all breeds of live stock at the present time; and it seems that the better bred a breed becomes the more numerous are the sterile animals found in it. A small per cent of the males of all breeds are sterile. A much larger per cent of females are barren. Often the female fails to produce for one or two seasons and then becomes productive again, while there are others which produce regularly for a certan length of time and then are permanently barren. A few females are sterile from birth and never can be made to produce at all owing to some congenital defect; but the number is not large enough to give any great concern.

The dairy cattle breeders who push their cows for record productions of milk and butter fat have difficulty in getting some of their best matrons to breed regularly. Hog breeders find some of their best breed and best show-ring specimens sterile. Some of the very heaviest laying hens produce only a small per cent of fertile eggs. Horse breeders, however, have the greatest trouble with sterility. An occasional stallion is sterile or partially so, while almost half the brood mares are barren for any given season or permanently nonproducers.

A considerable proportion of the farms within a radius of twenty-five miles of the Kentucky Experiment Station are devoted to one of the three breeds of light horses or to some other breed of registered stock. In cooperation with many of these breeding establishments a study of breeding has been made for the last nine years. Instead of depending on laboratory animals for material, free access to the males and females has been given the investigator by the owners of the stock farms. In this way animals sterile, or temporarily so, have been studied in a normal environment and under conditions which were as favorable for reproduction as any farm can give.

The purpose of this bulletin is to give a report of the work done to date on the nature and causes of sterility in the higher forms of domestic animals which have been studied. It has been prepared, not as a bulletin for general distribution, but for the use of those live stock breeders, who are interested in the production of blooded stock and for the use of those who are attempting to solve some of the problems of breeding. The very nature of the subject is such that it does not lend itself to a popular discussion. To be of value it is necessary to go into details and to use plain terms in describing those details; for these reasons it will be largely restricted in its use to those who are interested in breeding problems.

I. Sterile Males

Opinion of Breeders. The common opinion of breeders is that if a male is in good physical condition and can make a service he is fertile. One of the first results obtained by this study is that the outward perfection of the animal is no criterion by which to judge his breeding ability.

In horse breeding so many mares are barren for a year or two that even the record of a stallion in the stud is not always to be relied upon as a measure of his sexual potency.

Method of Determining Sterility in Males. Fortunately, the method of determining the breeding condition of males is not a difficult one. Normal semen contains innumerable sex cells, the spermatozoa, which may be observed by means of the microscope. The presence of very active spermatozoa in great numbers is essential to fertility. If a sample of semen can be obtained as a male completes a service, a drop can be placed on a slide and the spermatozoa examined directly. In the bulletin "Vitality of the Spermatozoa"[1] the writer has shown the character of the fields to be found in making such examinations. If the field, under lenses which magnify about one hundred diameters, is full of active, swiftly moving spermatozoa, it is almost absolute evidence of fertility. When such a field is found there is only one other test to make to be sure the male is not at fault. That test is to keep the semen, or part of it, at a room temperature of from 65 to 75 degrees Fahrenheit for two or three hours. The vigor of the sex cells should be noticed at intervals of fifteen minutes. Should the spermatozoa retain their vigor of movement for two hours or more it is positive evidence that the male is sexually potent.

Doubtful condition, sterility or partial sterility, results from too few a number of spermatozoa. As a rule, if the number of sperm cells is greatly reduced the vitality will be lowered also. Another border line condition is the inactivity of the sex cells or of the greater number of them. Sometimes approximately one-half are dead or inactive. The absence of all spermatozoa is proof of sterility.

EXAMPLES OF STERILITY IN MALES

In the course of the investigation which has been made for the past nine years during the breeding season, many examples of sterile males have been found. A description of some of these is given in the belief that a study of the individual cases will be instructive.

1. *A Standardbred Stallion.* The stallion was making a season at the stud of his owner and had seventy mares booked. In the routine of miscroscopic examinations being made on this farm of the stallions the first sample of his semen examined showed no sperm cells. Examinations on the following days confirmed the first examination.

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[1] 1922, Anderson, W. S., Bulletin No. 239, Ky. Exp. Station.

Apparently he was in perfect health. He carried all the flesh needed. The usual feeds for horses were given him and he had several miles exercise each day.

To learn what results had followed his work in the stud up to the time he was found sterile, an examination of the stud records was made. The first twenty-six mares to which he had been bred, or all which had gone long enough, had been back and rebred. The first sixteen had been bred to him three times each, at three successive heat-periods. While his stud service book showed this record, he had not been under suspicion when found sterile. He was in the hands of experienced horsemen, men who had given their entire time to horse breeding. The stallion was kept under observation the remainder of the season and was mated to fifty mares. At times a few feeble sperm cells were seen in his semen, but at no time did they approach one per cent of the number found in normal semen. The spermatozoa observed were perfect in physical conformation but had little or no vitality. In February of the next year a sample of semen showed enough live sperm cells to offer hope that he was returning to breeding condition, but the improvement disappeared with a few services in the new season. He was mated to twenty mares the second season, or to a total of seventy in the two years. The record books of the farm show that he did not sire a foal in the two seasons.

2. *A Standardbred Stallion.* Our attention was called to this stallion in the fall of the year after he had made two seasons. The first season he was bred to thirty mares and the second to seventy. There had been the usual returns for remating each season. Suspicion was aroused when the owners of all the thirty mares bred the previous year reported that they were barren. In November a report was asked from the owners of the seventy mares served the second spring. Something over thirty out of the seventy reported their mares were probably in foal. The results the following spring showed them to be in error, as not a mare produced a foal to his service. In the two years the stallion was mated to one hundred mares and did not get a single foal.

When called into conference we suggested a mating to secure semen. In the semen thus obtained no sperm cells were found. Forty-eight hours later another sample of semen was procured and examined but no sex cells were to be seen. The quantity of semen and the color of it would not have aroused suspicion. The stallion was then castrated and the cords and testicles turned over to us for examination. The testicles were normal and producing normal sex cells. There was, however, in each cord a center of inflammation which had closed the passageway and the secretions of the testicles, in which the sex cells float, had no outlet to the seminal vesicles.

The semen of the stallion was abundant and natural in appearance. The semen, of course, was secreted by the accessory sex glands and had no product of the testicles in it. He was, however, a very nervous horse and had to be kept on a wood floor as he would dig out with his front feet to a considerable depth the dirt in his stall. There had been some skin trouble of an eruptive nature after the end of the second season in the stud, a few weeks before we examined him. Perhaps this was due, as well as his restless disposition, to the efforts of the system to absorb the pus formed in the epididymis and cords. At any rate, castration seemed to relieve him entirely and he became a quiet, dependable gelding.

Every effort was made to study the history of this stallion to discover, if possible, if there had been any disease or other irregularity to cause the inflammation which resulted in closing the spermatic cords, but no reason could be found for the condition. A thoro examination of the organs before castration gave no reason to assume that the irritation had been caused by an external injury to the parts.

The epididymis of both testes was distended with pus and dead spermatozoa. The testicles appeared to be functioning by maturing spermatozoa which in due time reached the epididymis, there to be destroyed by mingling with the products of the inflamed organ.

3. *A Thoroughbred Stallion.* This stallion is one of the noted sires of thoroughbred horses and was kept at the time of

the observation to be mated to a few select mares of his owner. The first examination was made in April at the suggestion of the veterinarian who had the horse under his supervision. He had been mated and remated to a number of mares, with no evidence of impregnation. The microscope showed that he had only a few germ cells and they were of low vitality. He was examined often enough to confirm the first examination. The stallion was relieved of all stud duty for two weeks. His grain ration of oats only was changed to include hot mashes of bran at night. Green stuff was fed also, and a tonic given him.

At the end of two weeks the germ cells were abundant and of normal vigor. He was remated to all mares previously bred to him and the remainder booked to him; and he impregnated ninety-one per cent, a greater per cent than most stallions.

He is a good example of a male temporarily out of breeding condition. The change of food and the use of tonics may not have been the cause of his recovery. He might have regained his potency without treatment, or he might have grown continually worse until permanent impotency set in.

It is mere speculation to suggest the possible causes of the temporary derangement of the sexual functions. Some work done by us[1] on the hydrogen ion concentration of horse semen indicates that it may be due to an exhaustion of certain mineral elements in the animal metabolism. This hypothesis seems to be sustained by the quick responses which this stallion and others have made to a tonic containing phosphorus.

4. *A Thoroughbred Stallion.* This horse was a four-year-old stallion which had been raced as a two and three-year-old. There was no apparent reason why he should not have been sexually normal.

After he was bred to a number of mares in the early part of his first season in the stud it was found that his mares returned to be remated. The specimens of semen obtained for examination showed a very small number of sperm cells, and their vitality was very low. The best treatment which could be given the stallion did not make any change in the number or vigor of the germ cells. The mares were bred to other stallions and he was rested until the next February.

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[1] 1921. Anderson, Healy & Peter, Journal of the American Veterinary Medical Assn., No. 3, page 291.

The sample of semen obtained at the first mating in February showed some improvement in the number of sperm cells, but it seemed very doubtful if he would be successful in the stud. Being a stallion of excellent breeding his owner took the risk of mating him to some of his mares. After a few matings his semen showed only a very few sperm cells in a field and these were not vigorous in their movement. As time went by all the mares returned and had to be remated to other stallions. No treatment had any appreciable effect on this stallion and he had to be discarded.

5. *A Standardbred Horse.* The stallion in this case had been raced in his three-year-old form and placed in the stud the next year. He was making a normal season when it was noticed that more mares were returning about June 10-15 than should have been expected. A sample of his semen showed a sufficient number of sperm cells altho they were lacking in vigor of movement.

A very large number of small, sphere-like bodies were also present. As the writer had not before seen these bodies in the semen the sample was taken to the laboratory of bacteriology at the Experiment Station and there examined. It was agreed that the bodies were broken-down leucocytes or pus cells.

On the third day after the first sample of semen was secured the stallion discharged a considerable quantity of pus with the semen. From that time on the number of pus cells diminished but never during that season entirely disappeared. They became so few in number, however, that the number of sperm cells became normal and their vigor seemed to be undiminished. Except for the few mares mated to him when his semen showed the greatest amount of pus, there were no unusual returns; and the following season his mares produced the number of foals expected.

Examinations made the next season of his semen showed a few pus cells but not enough to affect adversely the number or the activity of the sperm cells. The third year after the disorder was discovered his semen still showed the presence of a small number of pus cells.

Examinations of his testicles on different occasions were made but we were never able to detect the presence of any inflammation. The stallion served promptly and in the usual way. There was, of course, some center of irritation, perhaps within the genito-urinary tract. No evidence, however, of it could be detected except by means of the microscopic examination of the semen; or at the times when considerable masses of pus were expelled with the semen.

The case is typical of a class, disordered by inflamed glands or an inflamed center in the genito-urinary canal.

6. *A Thoroughbred Stallion.* When this stallion was observed he was beginning the second season in the stud. He had been mated to thirty mares the previous season and only one proved to be in foal.

The statement was made to us by his owner that in making one of his first services he fell and severely injured a vertebra of his tail. After this injury he did not, it was reported, serve close. He would barely enter and discharge close to the vulva.

When he was allowed to serve a mare in our presence the story told of his service the previous season was confirmed. He had formed the habit of entering but a short distance, discharging and, of course, drawing out the discharge as he came down. The semen was found to be without fault. The barren mares, a great loss to the farm, were caused by his not giving a better service. Semen deposited just within the lips of the vagina will be wasted on the withdrawal. Frequently stallions are guilty of this fault and when it happens the service should not be counted but the mare remated.

7. *A Thoroughbred Stallion.* This stallion was found in the midst of a stud season with no mares seemingly settled from his efforts up to that time. In an endeavor to procure a sample of his semen he was given the opportunity to serve a mare. After repeated attempts and failures it was noticed that he was wasting a drop or two of semen, some of which was caught. The microscopic examination showed the number and vigor of germ

cells in it to be normal. When this was discovered the problem was simplified to one of getting him to make a proper discharge.

The feed given him up to this time had been crushed oats and hay. His exercise was taken early in the morning under saddle and he was ridden some eight or nine miles. The problem was to discover, if possible, the reason why he could not complete the service at the first effort. The writer advanced the theory that with oats only as a grain diet and so much exercise the glands were not secreting enough liquid semen to make the discharge possible when bred to one mare a day. The microscope showed that the testicles were functioning properly for there was a good supply of vigorous germ cells. It seemed that if the prostate gland and seminal vesicles were congested with semen he could not fail to discharge, and that his failure must be because of a lack of semen.

To encourage greater activity on the part of the prostate and Cooper's glands the diet was supplemented by giving a hot bran mash at night and by adding eighteen raw eggs a day to his ration. He was given exercise in the morning and rested until the afternoon, when he was mated. The change of time for breeding to the afternoon when his muscles had had time to completely relax, with the more stimulating diets, completely changed the stallion. He very soon was able to make the service at the first attempt. A large per cent of the mares mated to him after this became pregnant and produced vigorous foals the next year, many of which have since become successful racehorses. His case is interesting because he represents a nervous class of horses. Stud duty is exacting to them and easily exhausts their energy unless every condition otherwise is favorable. In the case under consideration the restricted diet and the unusual amount of exercise unfitted the animal for breeding purposes. When his diet was changed, his exercise lessened and a period of relaxation allowed before he was called upon to do his work, it changed him from an impotent to a potent stallion.

8. *A Standardbred Horse.* Perhaps the most unusual behavior of any male examined was that of this stallion. He is an

undersized horse and has trouble in serving large mares. It has been found necessary to catch semen as he comes down and artificially inseminate the mare, because he discharges just within the lips of the vulva and the semen is practically all withdrawn as he comes down.

The writer was present on an afternoon when he was attempting a service. He did not seem greatly interested and the groom remarked that he would come down without serving, as was his regular habit; and he had to go back usually before he completed the act. However, as he came away a fair supply of semen, some five cubic centimeters, was caught. There was no question in the minds of all concerned that the service had been made. Before the semen was injected an examination of it was made with the microscope. There were no sperm cells in it. This caused all the more surprise as the stallion is noted for the number and the vigor of his germ cells.

Immediately arrangements were made to breed him the next morning to the same mare. He behaved in the same way as the afternoon before. The semen secured had no germ cells. He was held near the mare while the slide was being prepared and the condition of the semen determined. He was ready to serve in a very few minutes and made the complete service in a satisfactory way, the semen from the full service being crowded with germ cells of the greatest vitality.

It appears that in dropping the small amount of semen, the stallion had a partial emission. Only that quantity of liquid secreted by the glands close to the opening of the urethra was discharged. The part of the semen held by the deeper reservoirs and containing the germ cells was not discharged until the final service.

The groom of the stallion stated that many services and discharges like the two just described had been made that season by him. There is no doubt that many horses make false services as this one did, and the mares are sent away as bred when no sperm cells have been imparted by the male.

9. *A Standardbred Stallion.* This stallion is one of the noted sires of his breed and had had very heavy stud service. In his

work he is slow. He is quiet and deliberate, but works without undue delay. His semen is very thin and more like water in appearance than it is like the semen of stallions. It lacks the milky color and the stringy tendency which is usually found in the semen of stallions.

While the color and physical condition of his semen were not as expected, the semen contained a sufficient number of sperm cells, all of which showed great activity. His record in the number of foals produced to his service is surpassed by few sires. He is recorded here to show that there are very great differences in the physical appearance of the semen of stallions and that the eye unaided cannot be trusted to judge the value of a discharge.

11. *A Thoroughbred Stallion.* It was found at the beginning of a breeding season that this stallion had failed to impregnate twenty out of twenty-five mares bred to him the previous year. The discovery led the owner to consult us. The first examination showed large quantities of pus in the semen. The discharge resembled more a pus discharge than it resembled normal horse semen. Floating in the pus-laden semen were immense numbers of live germ cells. Laboratory examination of the discharge and subsequent ones showed that the spermatozoa quickly lost their vigor. Careful examination of the horse located the seat of the trouble in one of the seminal vesicles. His testicles, epididymis and vas deferens gave no evidence of abnormality. It appears that these organs were functioning in the usual expected way, but that the partial if not total sterility was due to a seminal vesicle or some other organ discharging large quantities of pus into the semen at the time of ejaculation. The toxic effect of the pus no doubt robbed the sperm of their normal vigor and their ability to produce impregnation.

12. *A Thoroughbred Stallion.* Another unusual case came to light during the season of 1922. The result of this stallion's service in the stud during 1921 was disappointing as he did not have half as many mares in foal as he should have had. The few examinations which had been made of him in 1921 revealed nothing of a suspicious character.

When it was learned that he had failed so largely in 1921 we began to give him careful attention. We found that he was making only a partial discharge. The small quantity of semen ejected came evidently from some accessory sex gland and was without sperm cells. We found that he would go back at once and give a complete discharge. The semen from the second discharge was normal and contained large numbers of active sperm cells. The method was then regularly used of giving two services with only a few minutes intervening.

13. *A Valuable Jack.* This jack was purchased in Missouri and brought to Kentucky where he made a few successful seasons. He then had a rather mild attack of orchitis or inflamed testicles. After recovery he continued stud duty successfully for the next season but just at its close he had a second attack of orchitis. He was mated to a number of jennets during midsummer and fall, after the recovery from the second attack. In the following spring he was bred to twenty-five mares before it became apparent that he was sterile and a sample of his semen was obtained for examination.

The semen had no sex cells but the slide was a mass of pus cells. Examinations on other days found masses of pus discharged in the semen. In the meanwhile a third attack of orchitis was experienced by him. From this he seemed to make a complete recovery as he had done twice before. By this is meant that a physical examination made by a veterinary surgeon disclosed no physical defect or abnormality. From July, 1918, when he recovered from the second attack of the disease, until January 1, 1920, there had been no produce from his service, which included the jennets and twenty-five or thirty mares of the season of 1919. He was not used during the season of 1920 except to secure semen.

The value of the history of this jack is the fact that he made a complete recovery from one onset of the disease, but was made sterile by the return of the trouble. Another value is that while there were no outward signs of physical abnormality he was completely sterile. If placed in the sale ring on his appearance he could have passed as sound.

It should be noted that he served promptly, with no undue labor and without any evidence of discomfort. The clots of pus passed in the semen would not have been detected had no samples of the semen been taken for examination.

Everything which the veterinarian in charge knew to do was done for this jack but at the last examination, September 1, 1920, there was no improvement. The infection must have become so severe as to have permanently injured the sperm-forming cells of the testicles. No opportunity has yet been given the writer to castrate and examine the reproductive gland of a sterile male made so by orchitis.

Orchitis is of frequent occurrence in horses and jacks. It seems that most animals, at least, can resist one attack of the disease but there is very great danger of sterility when there are recurrences of the trouble.

In 1911 a case of orchitis was examined by an Experiment Station worker* and it was found that on lancing the testicle the discharge containned not only a bacillus which caused a green growth on agar but also a bacillus which was the same as that which causes infectious abortion in mares.

14. *A Jack Four Years Old.* This jack had a severe attack of orchitis. At the time of examination there was a somewhat swollen scrotum and testicles tho it had been months since the attack of orchitis. The jack was used on ten mares during the season, none of which produced to his service. The jack was given good care until the following season. By that time the swelling had entirely disappeared and he made a normal season getting an average number of foals. He is a good example of temporary sterility. The inflammation of the reproductive glands evidently rendered them unable to mature normal sex cells during the first season after the attack of orchitis, but when all swelling had subsided the gonads were able to function again.

15. *A Jersey Bull.* When attention was called to this animal he had failed to produce a calf in twenty months altho he was mated to a number of cows. An attempt to secure semen failed because he was unable to complete the act of mating.

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*1912. Good, E. S., Bulletin No. 165, p. 290. Ky. Expt. Station.

When he was slaughtered his reproductive organs were secured for examination. Scrapings from the testicles failed to show spermatozoa. Dr. Graham of the Kentucky Experiment Station made examination of the gonads and pronounced the cause of sterility to be premature senility, or fibroid degeneration. It was found, also, that the inability to serve was due to a severe inflammation of the intromittant organ. There seemed no connection between the fibrosis which rendered the gonads useless and the inflammation which made him unable to serve.

16. *A Hereford Bull.* The bull had been sold to go from Kentucky to Iowa. In that state he was used in a registered herd. There was complaint that he was unable to settle his females. When his new owner was convinced that he was a non-producer he reported that fact to the firm who bred him.

The firm refunded his purchase price and ordered him returned. He was given a chance in their own herd, but failed to sire a calf.

But one sample of his semen was obtained. It contained well-formed sperms but they were inactive. The bull was shipped to the market and no opportunity was given to examine his organs.

17. *A Shorthorn Bull.* The bull was used in a herd of thirty registered cows and heifers. Some of the females bred to him produced calves but a large per cent were barren. The longer he was used the greater was the number of cows that proved barren to his service.

One sample only of his semen was examined and it had a sufficient number of germ cells, but there was no evidence of life. The bull went to the shambles and no opportunity was offered to examine his gonads.

18. *A Mature Boar.* This animal had been fitted and successfully shown until he was mature. When first used as a breeding male very few sows produced to his services and the litters were not large.

It seems that no pigs were farrowed by the sows bred to him during his second season in the stud. During his third season opportunity for examination was given. The way in which he served and the appearance of the semen would not have aroused any suspicion of his fertility. Large numbers of sperm cells were in the semen, and slides mounted at once showed considerable movement of sperm, but a movement much less than normal. Another evidence of their low vitality was that motility ceased in a few minutes when they should have been active from four to six hours.

This boar was given tonics and compelled to take exercise but he made no improvement. As a last resort he was turned out on a farm with a small herd of sows and allowed to run at will with them over the fields. None of the sows produced to his service. Each examination made of his semen showed that the sperms were gradually decreasing in vigor altho the numbers were in no way diminished. This progressive loss of vitality continued until finally no evidence of life could be found in his spermatozoa. When it was discovered that the semen had an abundance of sperm cells without life the boar was castrated and the glands made available for examination.

The glands appeared to be normal. Portions were prepared for section but a change in the personnel of the laboratory at that time caused a loss of samples.

The animal showed a progressive change in the vigor of his sex cells going, under our observation, from the ability to sire an occasional pig to total sterility and to the stage in which all sperm were inactive. At all stages the animal's germ cells were of the usual size and form. He was active and served readily. No observer of his work could have detected anything wrong with him.

19. *A Duroc-Jersey Boar.* This was a young boar that on account of his conformation and pedigree was sold for a good price to head a purebred herd. None of the sows bred to him produced. The persons concerned shipped him to the Kentucky Agricultural Experiment Station where he could be examined.

Samples of his semen contained no germ cells. He served promptly and the semen gave no evidence of any irregularity, but the mounted slides showed no sperms. He was castrated by Dr. G. L. Hoeft of the Kentucky Experiment Station and the cords and testicles examined. The cords were in good condition but the liquid in them as well as scrapings from the testicles had no sperm cells. Dr. Hoeft prepared portions of the glands and made sections which showed the cause of the animal's sterility to be fibroid degeneration. That is, the fibrous, or connective, tissue of the testicles had developed to an abnormal extent thereby destroying the sperm-forming parts of the glands. There are reasons to believe that fibroid degeneration is the cause of sterility in many cases when the animal discharges no germ cells.

DISCUSSION

It is apparent that a sterile male may defeat the efforts of a breeder over a considerable period before it can be certainly determined by him where to place the blame. The return of a few females to be rebred may or may not be an indication of the breeding condition of the male. It all depends on the character of the females. However, the number of returns should be studied very carefully and if there be any suspicion the condition of the male should be certainly determined by examining his semen under a microscope.

A barren mare entails a loss of but one foal, but an infertile male may result in the loss of many possible foals. Our investigations show that in some cases as many as seventy mares have been bred to a single sterile stallion in one season, or a pen of twenty-five brood sows mated to a single impotent boar. Such mistakes are costly and the frequency with which they are made renders it wise for the breeder to exercise especial care in handling breeding males. The extent to which males contribute to the barrenness of females is not appreciated by practical breeders. The reason for this lack of knowledge is due to the inability of a breeder to determine the fertility or lack of it in any male. If the male is in good condition and serves readily with the usual discharge of semen he is considered fertile and any falling off in the production of young is blamed on the females.

There are a few classes into which, for the most part, nonbreeding males fall.

1. Fibroid degeneration of the testes is a condition frequently encountered. It is thought that young males too highly conditioned on rich protein feeds during their show career are injured for breeding by the process. Whether the cause of fibrosis is due to the feed or not, the condition is not infrequent and the purchaser of a breeding male should always buy him on condition that he is to be found fertile on trial. There is no possible remedy for fibrosis as the condition of the glands renders the production of sperm cells impossible because the tubules are transformed into a tough fiber-like structure.

One of the most dangerous aspects of the condition is due to the fact that the secondary sex glands function in a normal way in secreting semen and the sex desire is not necessarily diminished; consequently animals not capable of maturing a single sex cell may serve as promptly and as often as tho they were in good breeding condition and the discharge of liquid semen may be copious.

Fibrosis is not the normal condition of old age. It may or it may not be found in very aged males used in the stud. It is the writer's belief that in certain families of almost all breeds of domestic animals there is a tendency to develop a friboid condition of the sex glands, some in early life and others later in life. Sterility that is due to age and age only is caused by the exhaustion of the glandular material so that few or no gland cells are left out of which sex cells can be matured. As extreme age comes on the discharge will be less and less and will contain fewer and still fewer sex cells until the time comes when there are too few to expect impregnation to follow. As long, however, as sex cells are formed and liberated, their size, shape and activity will be identical to those of a younger animal. That is to say, as old age comes on the condition is not in any way reflected in the morphology or activity of the sex cells themselves. Their number may be very greatly lessened and a point reached where there will be no more liberated; but as long as the glands function in their production the sex cells differ in no way from those matured in youth.

If a condition is found where the shape or activity of the sperm cells is abnormal the cause must be attributed to some diseased condition rather than to age alone. The oldest stallion examined by the writer was 29 and the service at which the semen was obtained resulted in an impregnation and the next year in the birth of an excellent foal. The sex cells of this stallion were as active and vigorous as those of any young animal examined. However, a year later old age got in its work and the stallion was laid to rest to end his suffering. An investigation showed that he had ceased within the year to mature sperm cells.

2. Sterile males result from repeated attacks of orchitis. The inflammation of the glands, if severe enough or if repeated a sufficient number of times, ends in testes unable to mature sex cells. Little is known as to the cause of orchitis, and breeders as a rule do not understand the danger from the attacks. Any male that has had one or more severe attacks of the disease should be regarded with suspicion until it is proved that he is fully potent.

3. One of the most peculiar problems presented by the investigation is the class of males who regularly mature a large proportion of inactive sperm cells instead of all active ones. The proportion of the inactive sperm to the active cells varies from an insignificant number to more than one-half. Most of the males under our observation in this class have some offspring but none of them succeed in impregnating their full quota of females. Perhaps, the males commonly known as ''shy'' breeders fall into this class; and it is our opinion that a partial failure in the stud may often be traced to the presence of too great a number of dead sex cells among the active ones.

Since it has been determined that there are males of this character there has not been opportunity to adequately study them with a view of determining the cause of the condition or the remedy for it if there be one.

4. Another class of sterile or partially sterile males is the class that have pus in the discharge of semen. During the season of 1922 six stallions were discovered with a larger or smaller amount of pus in the seminal fluid. Some of these were sterile, others partially so and one, at least, did not seem to be in any way affected by the presence of the pus cells.

As far as the author is aware there is nothing in the literature on breeding which reports a case of sterility due to the presence of pus in the semen. It appears that our investigations are for the first time calling attention to this interesting cause of sterility.

One aspect of this matter is alarming. There is evidence, altho as yet not conclusive, that a stallion discharging certain kinds of pus cells may be communicating to the mare with whom he mates, the disease which is producing the pus in his own genito-urinary tract. The very presence of pus indicates that the stallion has some center of inflammation. If the organism which produces this center can be transferred by the male to the organs of the female there to start a center of growth the result will be, for the time, at least, a barren mare. Further study and investigation is contemplated on this matter.

CONCLUSION

From the facts stated it seems evident that the fertility of the male is not to be taken for granted; too many of them have been found to be infertile. It is also evident that a breeder has not the means to conclusively determine the breeding ability of his males if they are in condition and serve promptly. It requires examinations made under a microscope to be certain any male is potent if the knowledge is to be obtained during the breeding season.

II. Sterile Females

While an occasional male used in the stud is sterile the main loss from sterility is due to females. A large percentage of well-bred dairy cows are difficult to get with calf and many stop breeding at early ages. It often happens that the more milk a cow gives the more difficult it is to get her to breed. It is a well-known fact that one very popular type of Shorthorns almost became extinct because of the barren cows in the family.

The jennet and mare, of all domestic stock, are the most difficult to get to breed. Not one-half the mares in Kentucky that are bred any one year raise foals to maturity the next year.

Perhaps, two or three per cent of pregnant mares slip twin foals. Six to eight per cent will slip single foals. The breeders can depend on a loss of ten per cent from slipping foals, single and twins. This does not include any loss due to contagious abortion. When contagious abortion gets into a band of pregnant brood-mares it is liable to cause the majority of them to abort. Contagious abortion is caused by a specific germ, Bacillus abortivo-equinus,[1] which is communicated from one mare to another. There have been many outbreaks of contagious abortion in Kentucky but losses from it are not taken into consideration in this discussnon.

SOME CAUSES OF BARRENNESS IN MARES AND JENNETS

1. *Length of Heat Period.* The length of time a mare is in heat makes it difficult to know when to breed her. She may be in heat from three to nine days. No one knows when during the heat the egg is liberated. One egg only is liberated at each heat period. From work done with the semen of stallions[2] it seems unlikely that their sperm cells live longer than a few hours in the organs of the mare. If, then, the mating is made a day or two before the egg is shed or some days after, it is not probable that fertilization will follow.

The records we have been able to gather from the stud farms of Kentucky indicate that by the one mating a heat it requires an average of five matings to secure one impregnation. Each mare is mated on the average two and one-half times. One-half the mares bred are barren, so that but one foal can be expected from five services.

2. *Abnormal Discharges.* When this investigation was begun in 1914 the breeders of Kentucky paid but slight attention to the condition of the female at the time of breeding. Mares with obnoxious discharges were often mated with valuable stallions. The practical breeder gave little thought to any of the discharges caused by vaginitis, cervicitis or metritis. Gradually, however, the breeders came to recognize the futility of mat-

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[1] 1912. Good, E. S., Bulletin No. 165, Ky. Exp. Station. 1916. Good, E. S., and Smith, W. V., Bulletin No. 204, Ky. Exp. Station.
[2] 1922. Anderson, W. S., Bulletin No. 239, Ky. Exp. Station.

ing mares suffering from any inflammation of their organs. When the discharge was found the mare either received treatment with douches of salt and sodium carbonate solutions or was turned over to a veterinarian.

An exhaustive study of the causes of such inflamed conditions of the female organs as cervicitis, metritis and salpingitis is now being made by Dr. W. W. Dimock, Head of the Veterinary Department of this Station.

3. *Irregular Heat Periods.* One of the first problems presented to us after the investigations began was the cause of irregular heat periods.

A jennet was donated for examination which appeared to be in heat constantly for two years after dropping her last foal; and had not been in heat at all for the next two years. She was destroyed that an examination of her reproductive organs could be made. The vagina, os and uterus were intensely inflamed (vaginitis, metritis and cervicitis).

Both ovaries were greatly enlarged by cysts. The cystic bodies were so numerous and so large that all ovarian tissues had degenerated to the extent that ovulation had been rendered impossible. Evidently as the cystic centers began to form in the ovaries the jennnet because of this congestion or enlargement of the glands manifested evidence of heat and constant instead of periodic heat periods. When at last all ovarian tissue had been transformed by the excessive enlargement of the cysts the animal ceased permanently to show signs of heat.

4. *Examples of Barrenness.* Just what relationship, if any, exists between cystic ovaries and an inflamed uterus has not been determined; nor has the cause of the cystic condition been discovered.

Three mares were donated by the Patchen Wilkes Stock Farm in 1921. The mares had been barren, one for eight and two for six years. Each mare had been bred five or six times each year and there was no apparent external reason why they should have been barren.

A post-mortem examination of No. 1 revealed a severe metritis and ovaries so enlarged by cysts that ovulation had ceased.

The uterus of No. 2 was less inflamed than No. 1, but the ovaries were completely degenerated by cystic bodies. The mucus membrane of the organs of No. 3 appeared to be in good condition, but the ovaries were as greatly enlarged and as far in the process of degeneration as those of No. 1 and No. 2.

A technique is being developed by skilled veterinarians of manipulating the ovaries of cows, mares and jennets per rectum. In this way embryo cysts can be broken and the ovaries saved from the degeneration consequent upon the completely developed cystic condition. To be of the greatest value the examination and treatment should be made as soon as there is any evidence of non-production.

5. *A Registered Jersey Cow.* This cow failed to breed after having produced several calves. She came in heat regularly and was bred until hope of securing another pregnancy was abandoned. She was sent to the slaughterhouse, but we were allowed the privilege of securing her reproductive organs immediately after her slaughter. The ovaries were normal save for a few very small cysts and the corpus luteum showed the recent liberation of an egg.

The vagina and womb were normal but the horns of the uterus showed an inflammation. We were unable to determine any cause for the inflammation. The cow had been mated regularly for twenty months. Evidently what appeared to be a slight inflammation of the horns of the uterus had prevented conception. We have no way of knowing whether the cow represents a class of sterile animals or whether she is an isolated case; but we believe she represents a class.

6. *Hostile Secretions.* In June, 1916, a barren mare was made available for examination. She had failed to produce for five years preceding that date altho she had been bred each year from six to eight times during the breeding season. Her physical appearance gave no evidence of any cause of barrenness. Examination by means of the speculum did not show a disordered cervix or vagina.

She was mated to a young and vigorous stallion and a sample of his semen procured. After an examination had been made of a slide of the semen with the microscope a portion of it was inserted into the womb of the mare by means of a syringe used for artificial insemination. In two hours the sperm cells of the sample of semen retained as a control showed the usual vigor of semen held for that time. A sample obtained from the womb of the mare after it had been in the womb two hours gave no evidence of life.

The next day the experiment was repeated except that the semen was taken from the womb one hour after mating. In this short time the sperm cells had been deprived of the power of movement while the cells in the portion of semen kept for control had diminished little or none in their ability to move about.

Evidently there was in the womb of the mare some secretion unfriendly to the vigor of the sperm cells. This mare, no doubt, represents a type of barren mares, barren because of some abnormal secretion which destroys the vigor of the sperm cells before they can complete the journey thru the womb and horns into the fallopian tubes.

7. *Methods of Mating.* The fact remains, however, that a very great percentage of barrenness in mares is not due to disease or disorders but to the highly artificial method of mating horses. If a band of brood mares are turned into the pasture with a potent stallion, he will have foals by close to ninety per cent of them. Our best breeders rarely exceed fifty or sixty per cent. In the pastures the stallion will mate with each mare many times during one heat period, while under control a mare rarely gets more than one service. One would be sufficient were it made at the right time with reference to the liberation of the egg; but the time of liberation is one of nature's secrets not yet discovered by man.

There can be no doubt that the time of the shedding of the egg varies with the individual mares, the same mare, perhaps, behaving differently at different times. Assuming that such is the case, it is hopeless to expect a solution of the problem as long as the present method of breeding is employed.

The universal custom of horse breeding is to mate a broodmare if she does well at foaling time, on the seventh, eighth or ninth day after dropping a foal. Most breeders prefer the eighth day if the services of a stallion can be secured on that day. Experience shows that this time after foaling is the right time in which to get the greatest number of pregnancies. If it were possible to give two services to a mare with foal at side, in order to double the chance of obtaining pregnancy, they should be given on the eighth and tenth days, or seventh and ninth.

8. *Indifferent Mares.* Often when a mare fails to catch at her first mating she passes two or three periods without showing any signs of heat. This may be due to the drain on her system in supplying nourishment for the foal or it may be due to such a quiet temperament that she manifests little sign when in heat, or again it may be due to an extreme nervous nature that causes the mare to exhibit such great anxiety about her foal that she gives no visible signs of heat. On every farm where there are any considerable numbers of brood mares some of them will be barren because it is not possible to catch them in heat after the first mating on the 8th day. Foals are weaned and the mares placed in winter quarters in the belief that they are safe in foal to the one service on the eighth day. The disappointment of the breeder comes in the early winter when he discovers that many of the mares are not in foal. The discovery may not be made until as late as March or April. Usually, however, February or early March ought to find all barren mares giving signs of heat.

Whether it is possible to keep a closer watch on bred mares with foal at side, than some of our best breeders keep is a question, because many of them do everything that seems possible and yet they fail to detect signs of barrenness until it is too late to rebreed the mares.

The overcautious breeder who makes a mistake in trying a mare and breeds her because she does not fight the teaser as vigorously as she might, runs the risk of making his mare abort. More than one example of this nature has come under our observation on the farms, while making this study. One incident may represent the type.

9. *Induced Abortion.* A kindly-disposed saddle mare had been bred on the eighth day after dropping her foal. She was returned to the stud for trial on the 21st day and it was decided from her behavior that she was not in heat. After the lapse of another 21 days she came back and her behavior left doubt as to her condition. There were no positive signs of heat nor was there any noticeable objection to the approaches of the trial stud. It was decided to breed her and to make the service the more effective, as they thought, a hand was inserted and the os dilated before the service. In thirty-six hours after the mating the mare aborted and they were fortunate enough to find the small fetus and its membranes. Of course, when the mare recovered from the shock of the abortion it was too late to breed her again that season.

When a mare, barren for one season, comes up for breeding, certain things may be done that will aid in getting her settled. She should be examined, first of all, for any disorders of the genitalia. If there is a discharge of any kind the mare should not be bred until that is corrected.

By means of the speculum the breeder can see directly the condition of the vagina and also the os. A little experience in its use will soon enable the breeder to detect the normal condition of the organs. The irregular conditions which the washes or douches will not rectify should go to the hand of an expert.

10. *Time of Breeding.* Many barren mares are in heat in February and some breeders begin to breed them in that month. Our records of February and up to March 15th breedings show a very small per cent of pregnancies. Some seasons early matings are more successful than in other years, due perhaps to the nature of weather conditions. The barren mare that runs out without shelter or protection from the storms, with little or no grain feed will not be in good condition for breeding as early as the mare that has had shelter and a balanced grain ration.

Unless an early foal is especially desired for some futurity, the 15th of March is early enough to begin breeding the barren mares. If the weather of March is very cold, it may be well to wait until the better weather of April comes before beginning.

It seems to be the safest plan to wait until the good weather of March or April comes before beginning on the barren mares. It is good practis to breed the mare that foals on the 7th and 9th or 8th and 10th days after foaling, regardless of the time or weather conditions, for after all is done no better results are obtained than from the first mating after parturition.

After watching the practis of breeders for nine years and getting the records on thousands of matings, the writer believes the best policy to be to wait until warm spring weather. If need be, feed the barren mare grain and some wholesome roughage so as to get her into good physical condition; then mate her on the second or third day of her heat, and every other day after that as long as she stays in.

III. Artificial Insemination

To aid in reducing barrenness, a method of introducing into the uterus of a mare by capsule or syringe the semen of a stallion is becoming widely practist. If proper care is taken in its use, the method of artificial insemination is of considerable value. In the hands of a careless operator it may become a serious detriment.

Obtaining the Semen. Three or four methods are used to obtain the semen of a stallion. One method is to insert a syringe into the womb and draw out the semen, immediately after the mare is served. To do this the hand of the operator must be thrust into the vagina to direct the nozzle thru the os into the womb. With some instruments made for this purpose it is necessary to force a finger thru the os also, to direct the end of the syringe down to the floor of the organ.

The objection to this method of obtaining the seminal fluid is the evil results following the mechanical disturbance of the organs of the mare. Often in serving a mare the stallion or jack does not eject into the womb any large quantity of semen, because the os may be so restricted that little or no fluid can enter during coitus. The mechanical pressure necessary on the part of the operator to force a syringe and finger thru such a small os is liable to cause irritation, to start hostile secretions or to set up some adverse bacterial growth.

Another objection to entering the womb for semen is the liability of carrying from a diseased organ contaminated liquid to a healthy animal. The purpose of taking the semen out of the womb is to divide it into portions to be used in artificially inseminating other mares so that one discharge of a male can be used to inseminate two or more mares. It is far better to leave the mares untouched than to inject semen that has been extracted from the womb of another mare the condition of which is not known.

A study of the flora of the genital tract of the cow has been made, in part at least, and some work of the same nature has been done on the mare. These studies, while not complete, indicate that the organs of the female are frequently harboring infections and that it is dangerous to transfer semen from one female to another. The speculum may be used to examine the vagina of the mare, but even if that organ is normal it does not follow that the uterus is in the same condition.

It is a practis of doubtful value to divide the discharge of a stallion into portions for two or more mares. The larger the quantity of semen that can be placed in the womb of a mare, either by natural or artificial means, the greater is the opportunity for impregnation. One spermatozoon is all that is needed by the ovum, but experience proves that the larger the number in the initial discharge of the male the greater will be the probability of impregnation.

Another method of obtaining the semen is to extract it from the vagina of the mare served. There is little or no objection to this method as far as injury to the mare served is concerned. A syringe can be inserted into the vagina and the semen recovered from the floor of the rear part of this organ without irritating or injuring the mare, provided, of course, that the syringe is completely sterilized before use and the operator exercises due caution.

If in making the service the stallion injects the semen into the womb, none will be found in the vagina, or if most of it goes into the womb not enough for use can be recovered from the vagina. Some stallions, however, leave most of the semen in the vagina of the mare served, and all stallions will leave semen in the vagina of mares whose cervix fails to respond during coitus.

The same objection to using semen extracted from the vagina can be made as in using it from the womb, as far as carrying an infection from one animal to another is concernel. There is another and very serious objection to the practis of obtaining the semen from the vagina. It is the possibility of getting urine mixed with it. Some mares have naturally a considerable depression in the rear of the vagina which may be holding urine at the time of mating. Should the semen drop into it the urine will instantly kill the sperm cells and render the semen worthless.

A rubber bag can be utilized to catch the discharge with stallions that do not object to its presence. A large number refuse to work when it is adjusted. No more sanitary method is possible than the use of the breeder's bag, when the entire discharge is needed. It is better for the mares used in the service to receive a part of an uncontaminated discharge out of the rubber bag than to undergo the risk of contamination during the process of extracting a discharge.

The limitations, however, to the use of the rubber receptacle are found in the per cent of males who refuse to work when the bag is in place. No method has yet been discovered to overcome the aversion of a male to the use of the bag.

A method of collecting semen for artificial insemination practist by the expert veterinarians of Kentucky is as follows:

A small funnel about four inches wide at the top is used. The outlet of the funnel is plugged with a cork. Before use the funnel is sterilized in boiling water. The operator stands on the right of the stallion while he is serving the mare. In his right hand he holds the funnel and with his left he directs the organ of the stallion over the mouth of the funnel as he withdraws. By this means the semen which would have been lost is allowed to drop into the funnel, and it frequently amounts to from 5 to 10 cubic centimeters. At times the amount recovered is not enough for use, but a little experience in this method of collection soon results in the ability to obtain all that is necessary. However, in horse breeding where the stud fee is a large one, as with the Thoroughbred and Trotting horses, the semen collected is not used on a second mare but it is put by means of a syringe or capsule into the uterus of the mare served. The whole purpose of the artificial insemination after a natural service on the same mare is to increase the opportunities for impregnation.

If the stallion were able to transfer all the semen directly to the uterus, there would be no necessity for following the service with an additional amount of semen. It cannot be known that all, or even any large part, of a discharge goes directly into the womb, so that as a precaution the natural service is supplemented by catching all that is available and using it in addition. This is the universal practis in breeding valuable mares of the Thoroughbred and Trotting breeds.

Some breeders in Kentucky a few years ago thoroly tried out the practis of catching the semen and using it on another mare. The number of foals secured that way was so few that the method has been practically abandoned. Those breeders of Kentucky who produce utility horses and mules have found artificial insemination of such little value to them that they have practically discarded the method. The decrease in the demand for the service of jacks and common stallions has been so great that there is no need for any method to supplement the natural service.

The reason that only a small number of foals are obtained by artificial insemination without a natural service seems to be the small volume of semen available. The capsules used hold from 4 to 5 cubic centimeters of semen and it is not customary to use more than one of them. The complete normal discharge should be from 15 to 20 cubic centimeters and even more. Experience has shown that the entire quantity is not too much and whenever the amount is reduced by dividing the discharge between two or more mares the chances for fertilization are decreased.

At the suggestion of the writer some breeders, when a valuable mare is hard to catch, have adopted the method of mating every other day while in heat, and to catch at the end of each service all available semen and inject this by means of a syringe or capsule. This method has proved the most efficient yet devised to insure the impregnation of a valuable brood mare.

Methods of Insemination. There seems to be no especial objection to using either a syringe or capsule for placing the semen in the uterus. Both methods are used and both are successful. If a capsule is used very great care should be taken to keep it clean. If the os is small, as is the case with a great many young mares, it is a little more difficult to insert the capsule than it is to insert the syringe. One virtue in the use of the syringe is that it may be easily sterilized by placing it in boiling water; another slight advantage is that it does not dilate the cervix to the extent required for the capsule, nor does it leave a foreign substance in the womb as the capsule must do.

It is known that as large a body as the capsule may be so irritating to the uterus that it causes the mare to strain or exert muscular force to expel it, and in some cases it may be thrown to the ground before the capsule has had time to dissolve by the heat of the body.

Care of the Semen. In practis the funnel for catching the semen is sterilized by the use of boiling water and is raised to about animal heat by tepid water just before use. The life of the spermatozoa is not affected by the ordinary changes of temperature altho it may be just as well to keep the semen as near body temperature as possible. To do this the careful operator has water at hand of about 100°F. with which he keeps the funnel and syringe about the degree of animal heat.

To catch the semen with as little contamination from dirt and other debris as possible the mare is thoroly sponged and the stallion is kept very clean. With the utmost caution some foreign matter and hairs will fall into the semen. A very good practis is to strain the semen thru sterile gauze to take out the hairs and any large particles of dirt.

Length of Life of Spermatozoa. It has been shown by the author[1] that after semen has been obtained from a male at the end of copulation the life of the sperm cells has a very definite limit. Under the very best conditions the male sex cells begin to show loss of vigor in one or two hours and the extent of activity is from four to six hours. The semen is a perfect medium for bacterial growth and as the bacteria increase in the semen the vigor of the sperm cells diminishes.

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[1] 1922, Anderson, W. S. Bulletin Ky. Ag. Ex. Sta. No. 239.

In an attempt to obtain the get of a valuable sire semen has been taken considerable distances and used on females, but without result, because of the facts above stated. It is possible that semen may be carried from one farm to another close by and used successfully, provided the time elapsing does not exceed from 20 to 30 minutes, but the best practis is to have the mare present and to use it immediately after collecting.

It is not necessary in the technique of artificial insemination to protect the semen from light or even from the direct rays of the sun, as light has no appreciable ill effect on the vigor of the spermatozoa. Direct sunlight does not destroy the life of the sex cells instantly, as is the common belief, but it has rather an invigorating effect. Semen exposed to the direct rays of the sun for some minutes shows the sperm cells as very active. The increased vigor results in death somewhat sooner than if they had not been stimulated by sunlight.

Aid from Artificial Insemination. Too much should not be expected from the artificial method of breeding. It has a value and it has its limitations. Its most useful place is, perhaps, to follow the natural service of a stallion who cannot serve close and draws out most of the discharge as he comes down. To catch the semen and to use it on the mare is of much value. An occasional stallion cannot reach the average mare of his breed. He soon forms the habit of discharging just within the vulva and draws out the liquid as he comes off. It is in examples of this nature that a mechanical transfer of the semen to the organ of the mare is useful.

There are mares that require a number of services and when one of these is being bred it is well to follow the service with whatever semen can be collected, so as to add to the chances of fertilization. Some mares of this class may have a cervix unduly restricted, in which case a capsule or syringe can place the liquid within the womb when the natural service would not do so.

No Danger from the Artificial Method. Some owners of brood mares raise the question of ill results on the foal likely to follow the mechanical method of insemination. There is no danger of any deformity arising from its practis. Twins will not happen any oftener with it than without. Foals will be in every way the same as the result of the natural process alone. In short the breeder has all to gain and nothing to loose from the method. All, of course, dependent on the use of the right method with a due amount of caution as to cleanliness on the part of the operator.

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Kentucky
Agricultural Experiment Station

University of Kentucky

BULLETIN NO. 245

Analyses of Commercial Fertilizers

LEXINGTON, KENTUCKY

DECEMBER 31, 1922

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BULLETIN NO. 245

ANALYSES OF COMMERCIAL FERTILIZERS

By H. E. Curtis, H. R. Allen and Lelah Gault

This bulletin gives the results of analyses of fertilizers under the operation of the Fertilizer Law during the year 1922.

Those interested in the fertilization of different crops should apply to the College of Agriculture, the Experiment Station, or to their County Agent, and such literature as bears on the subject in which they are interested will be furnished. Bulletin No. 228 of the Experiment Station, showing the results obtained on the soil experiment fields, is of special interest to all users of fertilizers.

Samples Analyzed

During the year 1922, 883 brands of fertilizer were registered for sale. Of these, 429 were complete fertilizers containing all three of the essential ingredients—phosphoric acid, nitrogen and potash (non-acidulated bones containing potash are not included in this item); 123 acid phosphates; 152 nitrogenous superphosphates; 99 acid phosphate and potash mixtures; 70 bones, tankage and non-acidulated bones with potash; 6 nitrate of soda, 3 potash salts, and 1 containing nitrogen and potash.

Samples sent by manufacturers representing these various registrations, samples collected by our inspectors from fertilizers on sale in the State, and samples sent in by farmers, have been analyzed and the results are to be found in the following pages. The analyses have been grouped into tables according to the above classification and, in addition to the analyses, we have shown the index of relative value of each fertilizer, for the purpose of comparison. The following factors have been used in computing the index of relative value.

Available phosphoric acid in mixed fertilizers	1.5
Available phosphoric acid in acid phosphates	1.2
Insoluble phosphoric acid in mixed fertilizers	0.4
Phosphoric acid in bones	0.8
Nitrogen in all fertilizers	7.0
Potash in all fertilizers	4.0

Explanation of the Tables

In the tables of analyses, following the name of each brand, will be found the analysis of such samples as have been collected by our inspectors, sent in by farmers, or furnished by manufacturers, the manufacturer's guaranty being printed in italics. The figures set in bold-face type in these tables are those results which in the judgment of the Director are too low to be acceptable.

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	A. D. Adair and McCarty Bros., Inc., Atlanta, Ga., and Chattanooga, Tenn.	
64087	Adairs Soluble Pacific Guano	C. A. Casteel, East Bernstadt ......
63753	Old Glory Mixture	Manufacturer ....
63832	McCarty's Soluble Fertilizer	Manufacturer ....
64090	Adairs Standard Tobacco Grower	C. A. Casteel, East Bernstadt ......
64091		W. C. Stewart, Horse Cave ....
	The American Agr'l Chem. Co., Inc., Cincinnati, O.	
64094	A. A. C. Kentucky Tobacco Grower	Ray and Corbett, New Haven ....
64095		E. M. Haynes, Franklin ....
64584		D. Sanders, McKinney ....
63299	A. A. C. Tobacco and Truck Fertilizer	Manufacturer ....
64102	Bowker's Harvest Bone Phosphate	Browning, McReynolds and Co., Lewisburg ....
64591		T. E. Richardson, Campbellsville ....
64561	Bowker's Harvest Queen	Harvey Stout & Sons, Fern Creek ..
64103	Bowker's Fish Guano	C. P. Clarke, Owensboro ....
64104	Bowker's Corn and Wheat Phosphate	Gooch & Payne, Eubank ....
64562		Harvey Stout & Sons, Fern Creek ..
64592		Gooch & Payne, Eubank ....
64593		D. Sanders, McKinney ....
64105	Bowker's Grain and Grass Grower	Mayhew & Gilbert, Franklin ....
64106		J. E. Buck, Stanford ....
64594		Mayhew & Gilbert, Franklin ....
64107	Bowker's Complete Fertilizer	W. R. Strange & Co., Middlesboro ...
64108	Bowker's Tobacco and Truck Grower	Bokhara Seed Co., Falmouth ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.10	0.40	10.50	0.77		1.08	1.85	2.25	2.05		32.6	64087
10.00						*1.65*	*2.00*	*2.00*		*30.9*	
10.60	0.40	11.00		1.14	0.76	1.90	2.31	2.93		36.3	63753
9.00						*1.65*	*2.00*	*3.00*		*32.4*	
10.65	0.40	11.05	0.98			0.98	1.19	1.51		26.6	63832
10.00						*0.82*	*1.00*	*1.00*		*22.9*	
8.55	0.60	9.15				1.68	2.04	2.43		30.4	64090
7.65	1.65	9.30	0.73		1.39	2.12	2.57	2.64		32.8	64091
8.00						*1.65*	*2.00*	*2.00*		*27.9*	
9.75	1.00	10 75		0.73	0.89	1.62	1.97	0.84	1.25	32.2	64094
8.85	0.85	9.70		0.65	1.30	1.95	2.37	2.34		32.3	64095
8.30	1.35	9.65		0.97	0.58	1.55	1.88	2.24		29.0	64584
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*29.5*	
8.90	1.40	10.30		0.34	1.46	1.80	2.19	4.96		39.6	63299
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*38.5*	
9.95	1.00	10.95		0.35	0.52	0.87	1.06	1.42		24.8	64102
8.45	1.25	9.70		0.25	0.52	0.77	0.93	1.09		21.1	64591
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*21.5*	
9.05	0.90	9.95				0.79	0.93	2.23		25.4	64561
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*24.5*	
8.65	1.20	9.85				0.82	1.00	3.14		27.8	64103
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*27.5*	
11.50	0.50	12.00		0.37	0.59	0.96	1.17	1.07		26.4	64104
11.35	0.60	11.95				0.82	1.00	1.20		25.8	64562
10.85	2.10	12.95		0.25	0.53	0.78	0.95	1.06		25.0	64592
10.85	1.70	12.55		0.25	0.56	0.80	0.97	1.13		25.2	64593
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.5*	
9.95	1.50	11.45		0.62	1.20	1.82	2.21	2.17		33.0	64105
9.70	0.70	10.40		0.62	0.99	1.61	1.95	2.05		30.6	64106
8.45	1.75	10.20		0.76	0.89	1.65	2.00	2.25		30.0	64594
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*29.5*	
13.50	0.95	14.45		0.67	0.94	1.61	1.95	2.95		39.1	64107
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*38.5*	
11.80	0.85	12.65		1.78	0.84	2.62	3.18	1.34		37.8	64108
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*34.4*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.,	
64109	Bowker's High Grade Tobacco Grower	W. R. Strange & Co., Middlesboro ..
64110		John McCarley, Hopkinsville ....
64112	Bowker's Tobacco Grower	Mayhew & Gilbert, Franklin ....
63327	Bradley's Faultless Grain Grower	Manufacturer ....
63328	Bradley's Sure Crop	Manufacturer ....
63329	Bradley's Potato and Root Fertilizer	Manufacturer ....
63330	Bradley's Corn and Wheat Phosphate	Manufacturer ....
63331	Bradley's Grain and Grass Grower	Manufacturer ....
63332	Bradley's Complete Fertilizer	Manufacturer ....
63333	Bradley's Tobacco and Truck Grower	Manufacturer ....
63334	Bradley's High Grade Tobacco Grower	Manufacturer ....
63344	Cleveland Dryer Works Faultless Grain Grower	Manufacturer ....
63345	Cleveland Dryer Works Sure Crop	Manufacturer ....
63346	Cleveland Dryer Works Potato and Tobacco Fertilizer	Manufacturer ....
63347	Cleveland Dryer Works Phospho Bone	Manufacturer ....
64598	Cleveland Dryer Works Grain and Grass Grower	Grayson County Supply Co., Leitchfield
63349	Cleveland Dryer Works Complete Fertilizer	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.95	1.25	12.20		1.60	1.01	2.61	3.17	2.99		41.7	64109
10.40	0.85	11.25		1.36	1.07	2.43	2.95	3.22		40.2	64110
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*40.4*	
8.90	0.80	9.70		0.67	1.08	1.75	2.12	5.89		41.8	64112
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*38.5*	
8.80	1.00	9.80		0.88		0.88	1.07	1.12		22.2	63327
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*21.5*	
9.10	0.75	9.85		0.88		0.88	1.07	2.13		25.6	63328
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*24.5*	
9.35	0.85	10.20		0.89		0.89	1.08	3.44		30.0	63329
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*27.5*	
11.10	0.70	11.80		0.34	0.56	0.90	1.09	1.11		25.7	63330
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.5*	
9.05	1.25	10.30		0.34	1.44	1.78	2.16	1.96		30.6	63331
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*29.5*	
13.00	1.20	14.20		0.41	1.28	1.69	2.05	3.10		39.4	63332
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*38.5*	
11.70	0.90	12.60		1.70	0.88	2.58	3.13	1.34		37.4	63333
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*34.4*	
11.05	1.35	12.40		1.54	1.15	2.69	3.27	3.10		42.6	63334
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*40.4*	
8.80	1.00	9.80		0.88		0.88	1.07	1.12		22.2	63344
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*21.5*	
9.10	0.75	9.85		0.88		0.88	1.07	2.13		25.6	63345
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*24.5*	
9.35	0.85	10.20		0.89		0.89	1.08	3.44		30.0	63346
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*27.5*	
11.10	0.70	11.80		0.34	0.56	0.90	1.09	1.11		25.7	63347
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.5*	
8.00	1.70	9.70		0.74	0.66	1.40	1.70	2.15		27.5	64598
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*29.5*	
13.00	1.20	14.20		0.41	1.28	1.69	2.05	3.10		39.4	63349
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*38.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.,	
63350	Cleveland Dryer Works Tobacco and Truck Grower	Manufacturer ....
63351	Cleveland Dryer Works H. Gr. Tobacco Grower	Manufacturer ....
64123	Red Line Complete Manure	L. B. Sievers & Son, Somerset ......
64124		Albert Long, Scottsville ....
64601		Woodson Lewis, Greensburg ....
64602		Scaggs & Nunn, Horse Cave ....
64125	Michigan Carbon Works Sure Crop	L. B. Sievers & Son, Somerset ......
64776		Denton Hardware Co., Madisonville ..
64126	Homestead A-1 Potash Fertilizer	Staggs Bros. & Co., Vanceburg ......
64603		Scaggs & Nunn, Horse Cave ....
64604	Michigan Carbon Works Corn and Wheat Phosphate	Coleman Sharp, Liberty ....
64127	Homestead A Bone Black Fertilizer	L. B. Sievers & Son, Somerset ......
64128		E. M. Haynes, Franklin ....
64605		Lebanon Carriage & Impl. Co., Lebanon ....
64606		Frank Baker, Clarkson ....
64777	Michigan Carbon Works Complete Fertilizer	J. B. Polk, Taylorsville ....
64129	Homestead Tobacco and Truck Grower	The Jansen Hardware Co., Covington.
64130		Lebanon Carriage & Impl. Co., Lebanon ....
64131	Homestead Tobacco Grower	Scaggs & Nunn, Horse Cave ....
64132		Moss & Gibson, Crestwood ....
64607		Woodson Lewis, Greensburg ....
64778		Greenup Milling Co., Grayson ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN					POTASH			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number
11.70	0.90	12.60		1.70	0.88	2.58	3.13	1.34		37.4	63350
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*34.4*	
11.05	1.35	12.40		1.54	1.15	2.69	3.27	3.10		42.6	63351
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*40.4*	
9.90	0.60	10.50				0.86	1.04	1.17		23.8	64123
8.95	0.75	9.70		0.29	0.52	0.81	0.98	0.68	0.54	22.3	64124
9.20	1.65	10.85				0.84	1.02	1.09		22.9	64601
9.00	1.35	10.35		0.51	0.44	0.95	1.15	1.30		23.6	64602
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*21.5*	
8.65	0.65	9.30		0.28	0.54	0.82	1.00	2.10		24.5	64125
10.30	1.50	11.80		0.45	0.77	1.22	1.48	2.36		30.5	64776
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*24.5*	
9.10	0.50	9.60		0.35	0.49	0.84	1.02	3.41		29.1	64126
9.20	1.25	10.45		0.35	0.44	0.79	0.96	2.94		28.0	64603
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*27.5*	
10.95	2.05	13.00		0.31	0.52	0.83	1.01	1.07		25.4	64604
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.5*	
10.00	0.75	10.75		1.32	1.00	2.32	2.82	1.76		34.5	64127
9.45	0.60	10.05		0.74	1.34	2.08	2.53	1.92		32.7	64128
8.25	1.25	9.50		1.33	0.56	1.89	2.29	2.32		31.2	64605
8.75	1.50	10.25		1.57	0.43	2.00	2.43	1.48		30.2	64606
8.00	*4.00*	*12.00*				*2.06*	*2.50*	*1.50*		*30.5*	
14.00	1.20	15.20		0.77	0.97	1.74	2.11	3.07		41.1	64777
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*38.5*	
11.65	0.75	12.40		1.68	0.73	2.41	2.93	1.14		35.7	64129
11.80	0.90	12.70		1.95	0.81	2.76	3.35	1.22		38.3	64130
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*34.4*	
11.50	1.05	12.55		1.66	0.96	2.62	3.18	2.75		41.6	64131
11.85	1.00	12.85		0.48	2.20	2.68	3.25	3.26		44.0	64132
10.45	1.30	11.75		1.68	0.61	2.29	2.78	2.63		37.8	64607
12.30	1.00	13.30		1.84	0.70	2.54	3.08	3.00		43 1	64778
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*40.4*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.,	
64134	Homestead Potato and Tobacco Special	Staggs Bros. & Co., Vanceburg
64135		C. P. Clark, Owensboro
64608		Frank Baker, Clarkson
64779		Greenup Milling Co., Grayson
64140	N. W. Horseshoe Brand Dark Tobacco Grower	Woodson Lewis, Greensburg
63381	N. W. Horseshoe Brand Sure Crop	Manufacturer
63382	N. W. Horseshoe Br. Potash Manure	Manufacturer
64141	N. W. Horseshoe Brand Corn and Wheat Phosphate	Sam Terry, Big Clifty
64142		O. A. Bins, Eubank
64613		E. S. Ferrell & Sons, Buffalo
64143	N. W. Horseshoe Brand Challenge Corn Grower	Sam Terry, Big Clifty
64144		O. A. Bins, Eubank
64145	N. W. Horseshoe Brand Complete Fertilizer	Woodson Lewis, Greensburg
64146	N. W. Horseshoe Brand Tobacco and Truck Grower	Geo. W. Hill Co., Covington
64147	N. W. Horseshoe Brand H. Gr. Tobacco Grower	F. M. Mitchell, Scottsville
64148		Wainright Lae, Brooksville
63389	N. W. Horseshoe Br. Tobacco Grower	Manufacturer
63399	Packers Boar's Head Br. Faultless Grain Grower	Manufacturer
63400	Packers Boar's Head Br. Sure Crop	Manufacturer

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.65	1.65	10.30		0.59	1.03	1.62	1.97	5.45		39.7	64134
8.05	1.80	**9.85**		0.24	1.37	1.61	1.95	5.60		39.3	64135
8.75	1.00	**9.75**		**0.95**	0.71	1.66	2.02	5.34		39.5	64608
9.10	1.50	10.60		0.74	0.93	1.67	2.03	5.62		41.1	64779
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*38.5*	
9.45	1.05	10.50		0.34	0.48	0.82	1.00	1.06		22.7	64140
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*21.5*	
9.10	0.75	**9.85**		0.88		0.88	1.07	2.13		25.6	63381
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*24.5*	
9.35	0.85	10.20		0.89		0.89	1.08	3.44		30.0	63382
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*27.5*	
11.65	0.85	12.50		0.38	0.45	0.83	1.01	1.08		26.0	64141
11.30	0.90	12.20		0.31	0.51	0.82	1.00	1.14		25.7	64142
10.85	1.65	12.50		0.20	0.63	0.83	1.01	1.17		25.4	64613
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.5*	
8.75	1.90	10.65		0.60	1.01	1.61	1.95	2.59		31.2	64143
10.15	1.45	11.60		0.31	1.22	1.53	1.86	2.04		31 1	64144
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*29.5*	
13.00	0.85	**13.85**		1.12	0.62	1.74	2.11	3 79		41.7	64145
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*38.5*	
11.20	1.25	12.45		1.35	1.04	2.39	2.90	1.49		36 1	64146
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*34.4*	
9.70	1.25	**10.95**		0.95	0.77	**1.72**	2.09	5.29		41 2	64147
9.30	1.50	**10.80**		1.06	0.76	**1.82**	2.21	4.71		39.6	64148
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*40.4*	
8.90	1.40	10.30		0.34	1.46	1.80	2.19	4.96		39.6	63389
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*38.5*	
8.80	1.00	**9.80**		0.88		0.88	1.07	1.12		22.2	63399
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*21.5*	
9.10	0.75	**9.85**		0.88		0.88	1 07	2.13		25.6	63400
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*24.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc.,	
63401	Packers Boar's Head Br. Sure Growth Potash Manure	Manufacturer
63402	Packers Boar's Br. Corn and Wheat Phosphate	Manufacturer
63403	Packers Boar's Head Br. Corn and Wheat Grower	Manufacturer
63404	Packers Boar's Head Br. Complete Fertilizer	Manufacturer
63405	Packers Boar's Head Br. Tobacco and Truck Grower	Manufacturer
63406	Packers Boar's Head Br. High Grade Tobacco Grower	Manufacturer
63408	Packers Boar's Head Br. High Grade Vegetable Fertilizer	Manufacturer
	Armour Fertilizer Works, Louisville, Ky., Cincinnati, Ohio, and Nashville, Tennessee	
64150	Armour's Standard	R. L. Jones, Epworth
64151		Thurman & Enlow, Hodgenville
64614		Thurman & Enlow, Hodgenville
64615		G. W. Collins, Glens Fork
64563	Armour's Champion	R. M. Stark, Sulphur
64616		S. D. Harlin, Gamaliel
64152	Armour's Record Brand	W. O. Cropper, Burtonville
64617		S. D. Harlin, Gamaliel

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
9.35	0.85	10.20		0.89		0.89	1.08	3.44		30.0	63401
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*27.5*	
11.10	0.70	11.80		0.34	0.56	0.90	1.09	1.11		25.7	63402
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.5*	
9.05	1.25	10.30		0.34	1.44	1.78	2.16	1.96		30.6	63403
8.00	4.00	12.00				*1.65*	*2.00*	*2.00*		*29.5*	
13.00	1.20	14.20		0.41	1.28	1.69	2.05	3.10		39.4	63404
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*3.00*		*38.5*	
11.70	0.90	12.60		1.70	0.88	2.58	3.13	1.34		37.4	63405
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*34.4*	
11.05	1.35	12.40		1.54	1.15	2.69	3.27	3.10		42.6	63406
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*3.00*		*40.4*	
8.90	1.40	10.30		0.34	1.46	1.80	2.19	4.96		39.6	63408
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*38.5*	
8.55	2.60	11.15		0.37	0.43	0.80	0.97	1.12		22.0	64150
7.75	0.50	8.25				0.97	1.18	1.20		21.3	64151
9.55	0.65	10.20		0.46	0.32	0.78	0.95	1.20		22.9	64614
9.05	3.20	12.25		0.21	0.22	0.43	0.52	1.52		22.0	64615
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	
8.20	1.30	9.50		0.44	0.47	0.91	1.10	3.96		30.2	64563
8.50	0.50	9.00		0.38	0.64	1.02	1.24	4.23		31.8	64616
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*29.3*	
10.75	0.50	11.25		0.37	0.54	0.91	1.10	1.36		25.9	64152
10.40	0.70	11.10		0.22	0.88	1.10	1.34	1.38		26.6	64617
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*23.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works.	
64153	Armour's Wheat, Corn, and Oats	W. O. Cropper, Burtonville
64154		R. Willis, Brownsville
64618		Frank Henry, Center
64619		Taylor County Supply Co., Campbellsville
63499	Armour's Kentucky Colonel	Manufacturer
64156	Armour's Grain Grower	Thurman & Enlow, Hodgenville
64780		D. M. Brakefield, Adairville
64157	Armour's Big Crop Beef, Blood, and Bone	Sam Hughes & R. H. Lile, Leitchfield
		Ed. Allen & Co., Smith's Grove
64158		Thurman & Enlow, Hodgenville
64621		Merrifield & Humphrey, Bloomfield
64781		
64159	Armour's Big Crop H. Gr. Potato Grower	Chas. D. Tyler, Jeffersontown
64564	Armour's Big Crop Truck Grower	C. S. Brent Seed Co., Lexington
64160	Armour's Big Crop Favorite	Cadiz Hardware Co., Cadiz
64163	Armour's Big Crop Tobacco Maker	Ed. Allen & Co., Smith's Grove
64164		W. O. Cropper, Burtonville
64622		Ransom Hatter, King's Mountain
64165	Armour's Big Crop Tobacco and Potato Grower	J. J. Stewart, Brownsville
		Ranson Hatter, King's Mountain
64623		

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
12.50	1.10	13.60	0.37	0.53		0.90	1.09	1.49		29.1	64153
11.90	3.70	15.60		0.46	0.44	0.90	1.09	1.54		29.4	64154
13.80	2.00	15.80		0.20	0.33	0.53	0.64	0.61		26.5	64618
13.00	0.50	13.50				0.78	0.95	1.45		28.7	64619
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	
10.25	3.05	13.30				0.90	1.09	2.23		28.7	63499
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*26.3*	
9.50	0.40	9.90	1.23		0.36	1.59	1.93	2.61		31.8	64156
8.90	2.40	11.30		0.67	0.80	1.47	1.78	2.04		29.3	64780
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*28.3*	
11.55	0.65	12.20	0.62	0.45	0.45	1.52	1.85	2.44		34.0	64157
12.20	1.10	13.30	1.06		0.29	1.35	1.64	2.08		33.0	64158
11.90	1.60	13.50		0.63	0.71	1.34	1.63	1.74		31.9	64621
11.90	2.00	13.90		0.53	0.80	1.33	1.61	2.23		33.3	64781
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*34.3*	
10.50	0.65	11.15		0.93	0.75	1.68	2.04	4.35		39.1	64159
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	
9.70	0.25	9.95	0.56	0.90	1.15	2.61	3.17	1.64	0.89	37.9	64564
8.00	*1.00*	*9.00*				*3.29*	*4.00*	*3.00*		*41.1*	
9.75	2.90	12.65		0.88	0.78	1.66	2.02	5.28		41.6	64160
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*6.00*		*46.3*	
6.35	3.00	9.35	0.47		0.35	0.82	1.00	1.32	0.73	21.8	64163
8.45	0.75	9.20	1.30		0.38	1.68	2.04	1.94	2.05	35.0	64164
8.40	2.50	10.90		0.74	0.76	1.50	1.82	3.95		34.5	64622
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*34.3*	
9.80	5.50	15.30		0.87	0.97	1.84	2.23	2.29		34.8	64165
10.25	2.50	12.75		0.69	0 98	1.67	2.03	1.01		29.4	64623
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*2.00*		*31.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works.	
64166	Armour's Big Crop Burley Tobacco Grower	Barren C. Grocery & Hdw. Co., Glasgow
64167		Cantrell & Penick, Greensburg
64624		Ransom Hatter, King's Mountain
64168	Armour's Tobacco Guano	W. O. Cropper, Burtonville
64169	Armour's Special Tobacco Grower	J. W. Schoolcraft, Somerset
64170		Bradshaw, Hagan & Co., Tompkinsville
63516	Armour's Plant Bed Special	Manufacturer
64180	Armour's Big Crop Double Standard	Ed. Allen & Co., Smith's Grove
64565		R. M. Stark, Sulphur
64629		G. M. Hedrick, Monticello
64566	Armour's Big Crop 2-6-6 Fertilizer	R. M. Starke, Sulphur
63527	Ideal H. Gr. Blood and Bone	Manufacturer
63529	Ideal Tobacco Grower	
63530	Ideal Grain Grower	Manufacturer
63532	Ideal Special Tobacco Guano	Manufacturer
64182	Ideal H. Gr. Tobacco Grower	T. J. Turley Co., Owensboro
64183	Big Giant	Sam Hughes & R. H. Lile, Clarkson
64542	Armour's Big Crop Wheat Special	Manufacturer

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
9.50	2.90	12.40				1.54	1.87	1.51	1.69	34.3	64166
8.65	1.90	10.55	1.20	0.53	0.45	2.18	2.65	3.28	1.96	42.5	64167
8.05	1.75	9.80		1.36	1.05	2.41	2.93	5.83		44.7	64624
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*45.2*	
8.90	0.65	9.55	0.96		0.64	1.60	1.94	1.36		27.3	64168
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*1.00*	*25.3*	
9.05	3.00	12.05		0.38	0.58	0.96	1.17	0.99		23.5	64169
8.45	3.55	12.00		0.49	0.56	1.05	1.27	0.99		23.4	64170
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*20.3*	
12.25	1.35	13 60				2.77	3.36	1.62	0.53	42.0	63516
12.00	*1.00*	*13.00*				*2.47*	*3.00*		*2.00*	*39.2*	
16.70	0.90	17.60	0.93	0.61		1.54	1.87	2.87		43.3	64180
16.65	1.65	18.30		1.14	0.67	1.81	2.20	2.35		43.6	64565
16.45	1.20	17.65	0.26	1.00	0.28	1.54	1.87	1.94		40.2	64629
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
7.45	1.05	8.50		1.19	0.43	1.62	1.97	4.96		36.2	64566
6.00	*1.00*	*7.00*				*1.65*	*2.00*	*6.00*		*37.3*	
10.05	2.95	13.00		1.72	0.75	2.47	3.00	1.55		35.7	63527
10.00	*1.00*	*11.00*				*2.47*	*3.00*	*1.00*		*33.2*	
											63529
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*1.00*	*28.3*	
7.75	4.10	11.85		0.53	0.96	1.49	1.81	1.30		26.1	63530
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	
10.10	2.60	12.70		1.26	0.62	1.88	2.28	1.58	0.71	34.4	63532
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*2.00*	*31.3*	
10.45	0.90	11.35		0.94	0.58	1.52	1.85	8.38	1.12	53.7	64182
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*10.00*	*55.3*	
11.25	1.00	12.25				1.91	2.32	3.40	8.87	65.6	64183
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*15.00*	*70.3*	
10.65	1.25	11.90		1.29	0.56	1.85	2.25	4.30		40.5	64542
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works	
64551	Ideal Wheat Grower	Manufacturer
	C. S. Brent Seed Co., Inc., Lexington, Ky.	
64567	Brent's Tobacco Special	Manufacturer's Warehouse
64568	Brent's Grain Grower	Manufacturer's Warehouse
	Buhner Fertilizer Co., Seymour, Ind.	
64516	Buhner's 1½-10-3	Manufacturer
64518	Buhner's 3-8-5	Manufacturer
	Calumet Fertilizer Co., New Albany, Ind.	
63756	Calumet Brand H. Gr. Tobacco and Truck Grower	
64631	Calumet Br. Otto Voyles' Two in One	Vine Grove Feed Co., Vine Grove
64632		I. K. Miller & Sons, Campbellsville
64184	Calumet Br. Corn and Wheat Special	Frank Baker, Clarkson
64185	Calumet Br. Potato and Tobacco Special	Pearson & Breedlove, Franklin
64570		Lexington Seed Co., Lexington
63760	Calumet Br. Two Eight Two	

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.55	2.65	11.20		1.01	0.75	1.76	2.14	0.94		27.3	64551
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*1.00*		*25.3*	
9.15	0.65	9.80	0.43		0.57	1.00	1.21	1.24	1.73	28.9	64567
8.00						*1.65*	*2.00*		*3.00*	*30.9*	
9.45	0.50	9.95		0.25	0.58	0.83	1.01	1.22		23.0	64568
8.00						*0.82*	*1.00*	*1.00*		*19.9*	
11.15	3.40	14.55	0.63		1.26	1.89	2.29	2.83		37.9	64516
10.00						*1.23*	*1.50*	*3.00*		*31.4*	
11.35	1.85	13.20	0.84		1.52	2.36	2.87	5.51		48.5	64518
8.00						*2.47*	*3.00*	*5.00*		*41.8*	
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*4.00*		*43.4*	63756
17.30	3.40	20.70				1.68	2.04	1.86		43.0	64631
15.60	3.80	19.40				1.76	2.14	1.92		41.2	64632
16.00	*4.00*	*20.00*				*1.65*	*2.00*	*2.00*		*41.5*	
14.25	0.75	15.00		0.83	0.76	1.59	1.93	2.22		37.9	64184
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*35.5*	
9.95	1.10	11.05		0.93	0.85	1.78	2.16	2.80	2.09	40.7	64185
8.55	0.90	9.45	0.28	0.81	0.53	1.62	1.97	4.39		36.0	64570
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*38.5*	
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*29.5*	63760

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Calumet Fertilizer Co.	
64186	Calumet Br. Tobacco Manure	Sturgis Impl. & Hdw. Co., Sturgis ..
64187		Pearson & Breedlove, Franklin ......
64571	Calumet Br. Ky. Crop Grower	Lexington Seed Co., Lexington .....
64188	Calumet Br. Half Thirteen One	G. M. Hedrick, Monticello ....
64189	Calumet Br. Bone Phosphate and Potash Mixture	Frank Baker, Clarkson ....
64633		A. W. Tarter, Columbia ....
64634	Calumet Br. Half and Half	Vine Grove Feed Co., Vine Grove ...
	The Cincinnati Phosphate Co., (owned and operated by Armour Fertilizer Works,) Cincinnati O.	
63601	High Grade Manure	Manufacturer ....
63602	Grain and Grass Grower	Manufacturer ....
63603	Crop Booster	Manufacturer ....
63604	Tobacco and Potato Grower	Manufacturer ....
63605	Favorite Grain Grower	Manufacturer ....
63606	Conservation Brand	Manufacturer ....
63607	Sure Crop	Manufacturer ....
64195	Grain Grower	G. W. Collins, Glensfork ....
64637		L. R. Hart, Big Clifty ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.95	0.50	**9.45**		0.21	0.61	0.82	1.00	3.16		28.0	64186
9.55	0.95	10.50		0.42	0.49	0.91	1.10	1.40	1.92	30.1	64187
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*27.5*	
8.40	0.90	**9.30**	0.57		0.37	0.94	1.14	0.96	0.41	22.7	64571
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*21.5*	
15.55	1.00	16.55				0.49	0.59	0.84	0.48	30.6	64188
13.00	*2.50*	*15.50*				*0.41*	*0.50*	*1.00*		*26.0*	
11.60	0.55	12.15		0.20	0.24	0.44	0.53	0.56	0.66	23.9	64189
10.50	1.30	**11.80**				0.41	0.50	0.74		**21.0**	64633
10.00	*4.00*	*14.00*				*0.41*	*0.50*	*1.00*		*22.1*	
10.50	2.00	12.50				2.16	2.62	1.60		34.3	64634
6.00	*6.00*	*12.00*				*2.06*	*2.50*	*1.00*		*26.8*	
13.10	1.30	14.40		0.21	0.79	1.00	1.21	1.13		29.6	63601
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	
10.30	3.15	13.45		0.38	0.60	0.98	1.19	2.36		29.7	63602
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*26.3*	
9.95	3.15	13.10		0.25	0.63	0.88	1.07	1.36		25.5	63603
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*23.3*	
8.35	1.15	9.50		0.45	0.50	0.95	1.15	4.45		32.0	63604
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*29.3*	
7.60	1.80	9.40		0.37	0.61	0.98	1.19	1.78		23.3	63605
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	
13.00	0.90	13.90		1.33	0.61	1.94	2.36	2.13		37.9	63606
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*34.3*	
10.70	1.40	12.10		1.24	0.62	1.86	2.26	4.41		41.0	63607
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	
9.00	3.35	12.35		0.87	0.66	1.53	1.86	2.36		31.1	64195
8.70	0.80	9.50		1.04	0.57	1.61	1.95	1.97		28.9	64637
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*28.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Cincinnati Phosphate Co.	
64197	Big Tobacco Maker	G. E. Nell, Gradyville
64198	Burley Tobacco Grower	G. E. Nell, Gradyville
63619	Special Tobacco Grower	Manufacturer
64199	Double Standard	G. W. Collins, Glensfork
63621	Capitol 2-16-2 Fertilizer	Manufacturer
	Consolidated Chem. Co., Louisville, Ky.	
64200	Camel Brand Corn and Wheat Special	J. E. Marsh, Cooper
64201		Will Garner, Burnside
63970	Camel Brand Grain Grower	Manufacturer
63971	Camel Brand Grain and Grass Grower	Manufacturer
63972	Camel Brand Universal Crop Fertilizer	Manufacturer
63973	Camel Brand Vegetable, Potato, and Tobacco Special	Manufacturer
64787	Camel Brand Blue Grass Tobacco Grower	J. F. Collings, Shepherdsville
64202	Camel Brand High Grade Special	Will Garner, Stop
64572		D. A. Davis & Son, Jeffersontown
64788		J. D. Campbell, Monticello

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.90	1.05	9.95	1.18		0.54	1.72	2.09	2.30	2.26	37.8	64197
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*34.3*	
9.50	1.65	11.15	1.02	0.70	0.59	2.31	2.80	3.30	2.52	46.2	64198
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*45.2*	
8.55	3.20	11.75		0.44	0.47	0.91	1.10	0.85		22.1	63619
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*20.3*	
13.55	1.50	15.05	0.39	0.86	0.55	1.80	2.19	2.24		38.5	64199
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
16.40	2.25	18.65		0.76	0.98	1.74	2.11	2.11		42.3	63621
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
11.90	1.50	13.40	0.53		0.30	0.83	1.01		1.57	28.1	64200
12.50	6.60	19.10	0.56			0.56	0.68	1.01		27.8	64201
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
11.80	1.90	13.70				0.56	0.68		0.86	24.4	63970
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*0.50*	*22.1*	
10.10	1.50	11.60				0.52	0.63		1.22	22.5	63971
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*1.00*	*19.1*	
13.30	1.70	15.00	0.65		0.43	1.08	1.31		1.42	31.4	63972
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*27.5*	
12.20	1.80	14.00	0.61		0.47	1.08	1.31	0.82	3.11	37.3	63973
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*32.0*	
9.00	0.70	**9.70**	0.90		0.42	1.32	1.60	4.36		34.8	64787
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*4.00*	*33.0*	
11.30	4.40	15.70	0.78		0.65	1.43	1.74	0.90	1.10	33.3	64202
10.15	1.35	**11.50**	1.25		0.44	1.69	2.05	2.49		33.4	64572
10.80	0.80	**11.60**		0.87	0.92	1.79	2.17	2.26		34.0	64788
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Consolidated Chemical Co.	
64203	Camel Brand Extra High Grade Tobacco Fertilizer	Will Garner, Stop ....
64204		Zula Milling Co., Zula ....
64205	Camel Brand Tobacco Fertilizer	Will Garner, Stop ....
64206		Hudson & Farnau, Lancaster ......
64207	Camel Brand Standard Grain Fertilizer	Zula Milling Co., Zula ....
64639		E. S. Ferrell & Sons, Buffalo ....
63979	Camel Brand Truck and Tobacco Fertilizer	Manufacturer ....
63980	Camel Brand Bright Tobacco Special	Manufacturer ....
63981	Camel Brand General Crop Fertilizer	Manufacturer ....
64208	Camel Brand One Ten One Fertilizer	Zula Milling Co., Zula ....
	Darling & Co., Chicago, Ill.	
64069	Darling's Farmers Favorite	
	Duncan & Sherley, LaGrange, Ky.	
64211	Tiger Brand Special Tobacco Grower	Manufacturer's warehouse ....
	The Empire Guano Co., Nashville, Tenn.	
63267	Wheat, Oat, and Corn Grower	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.40	2.95	14.35	0.84		0.80	1.64	1.99	2.68	1.43	40.5	64203
11.55	2.40	13.95	1.30		0.58	1.88	2.28	0.88	2.83	40.7	64204
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*38.5*	
9.10	7.70	16.80	0.66		1.01	1.67	2.03	2.00		32.8	64205
10.15	1.60	11.75	0.61	0.62	0.56	1.79	2.17	2.26		33.4	64206
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
9.60	1.75	11.35	1.29		0.45	1.74	2.11	0.62	1.44	31.7	64207
9.15	0.65	9.80	1.18		0.58	1.76	2.14	2.16		31.0	64639
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
10.30	2.40	12.70	2.14		0.78	2.92	3.54	1.02	2.94	45.8	63979
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*3.00*	*37.4*	
11.90	1.60	13.50	1.38		0.79	2.17	2.63	0.46	0.99	35.9	63980
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*28.0*	
11.80	1.40	13.20	0.67		0.51	1.18	1.43	0.78	1.86	33.3	63981
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
11.80	1.95	13.75	0.60		0.58	1.18	1.43		1.31	29.5	64208
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*24.5*	
8.00	*2.00*	*10.00*				*2.47*	*3.00*	*4.00*		*39.6*	64609
12.35	2.65	15.00		0.37	1.03	1.40	1.70	3.88		39.6	64211
10.00	*2.00*	*12.00*				*1.65*	*2.00*		*4.00*	*37.7*	
9.65	6.30	15.95				1.45	1.76	1.55		30.4	63267
7.00	*10.00*	*17.00*				*0.82*	*1.00*	*1.00*		*22.4*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Empire Guano Co.	
63268	Climax Tobacco Grower	Manufacturer ....
64212	Blood, Bone, and Potash	Young Hardware Co., Hopkinsville ...
64792	Kentucky Premium Guano	Calloway County Farm Bureau, Murray ....
64213 64654	High Grade Tobacco Grower	Young Hardware Co., Hopkinsville .. F. B. Lacy, Hopkinsville ....
63272	Red Banner Special	Manufacturer ....
64641	Wheat and Corn Grower	G. W. Collins, Glensfork ....
63275	Clover and Wheat Special	Manufacturer ....
	The Evansville Packing Co., Evansville, Ind.	
63448	Grain Booster	Manufacturer ....
63451	Harvest King	Manufacturer ....
63452	Golden Harvest	Manufacturer ....
64219	Farmers Pride	M. F. Hopson & Son, Cerulean ...
64220 64221	Three "B"	Atherton-Kidd Co., Livermore .... C. B. Carden & Co., Hartford ....
64222	Half and Half Mixture	Atherton-Kidd Co., Livermore ....
63457	Corn and Wheat Special	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.00	7.60	17.60				1.58	1.92	0.60	0.34	30.3	63268
8.00	*5.00*	*13.00*				*0.82*	*1.00*		*1.00*	*21.9*	
9.10	2.10	11.20	0.60		0.94	1.54	1.87	2.95		32.5	64212
8.00	*5.00*	*13.00*				*1.65*	*2.00*	*2.00*		*29.9*	
10.10	6.10	16.20	0.20		0.34	0.54	0.66	2.84	1.04	32.5	64792
8.00	*5.00*	*13.00*				*0.41*	*0.50*	*4.00*		*28.5*	
9.15	2.50	11.65	0.32		1.41	1.73	2.10	2.18	2.37	38.8	64213
10.50	4.20	14.70				1.83	2.22	5.07		43.6	64654
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*4.00*	*35.9*	
11.75	2.60	14.35				2.14	2.60	2.87		40.1	63272
10.00	*5.00*	*15.00*				*1.65*	*2.00*	*2.00*		*32.9*	
14.45	1.60	16.05	0.53			0.53	0.64	1.16	0.82	31.4	64641
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*24.0*	
14.35	1.40	15.75				1.44	1.75	2.37		37.8	63275
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*2.00*		*30.1*	
14.80	0.10	14.90		1.54	0.47	2.01	2.44	1.90		40.0	63448
8.00						*0.82*	*1.00*	*1.00*		*19.9*	
13.25	0.15	13.40		1.59	0.54	2.13	2.59	3.03		41.8	63451
8.00						*1.00*	*1.21*	*2.00*		*24.0*	
12.75	0.15	12.90		1.14	0.43	1.57	1.91	3.26	0.98	41.3	63452
8.00						*0.82*	*1.00*	*3.00*		*25.9*	
12.90	0.95	13.85		0.51	0.51	1.02	1.24	0.97		28.8	64219
12.00						*0.82*	*1.00*	*1.00*		*25.9*	
7.90	0.80	8.70		0.80	0.49	1.29	1.57	2.32		26.9	64220
9.70	1.30	11.00		0.87	0.79	1.66	2.02	2.05		31.2	64221
8.00						*1.65*	*2.00*	*2.00*		*27.9*	
8.90	1.10	10.00		1.54	0.76	2.30	2.79	1.47		32.0	64222
10.00						*2.47*	*3.00*	*1.00*		*32.8*	
14.60	0.30	14.90		0.95	0.32	1.27	1.54	2.24	0.57	38.1	63457
12.00						*0.82*	*1.00*	*3.00*		*31.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Evansville Packing Co.	
64223 64644	Potato and Tobacco Grower	C. B. Carden & Co., Hartford .... Eldred Hardware Co., Princeton ......
63459	Farmers' Special	Manufacturer ....
64224 64033	Tobacco Special	M. F. Hopson & Son, Cerulean .. Leander Wiggins, S. Carrollton ......
	Federal Chem. Co., Inc., Louisville, Ky.	
63665	Daybreak A-1 Champion	Manufacturer ....
64226 64227 64645	Daybreak Wheat and Corn Special	Burks & Anderson, Monticello ...... J. N. Sanderson, Mayfield .... A. W. Tarter, Columbia ....
63667	Daybreak Cracker-Jack	Manufacturer ....
63668	Daybreak Special	Manufacturer ....
64228	Royal Wheat and Grain Special	Lake Brothers, Springfield ....
63670	Daybreak Special Manure	Manufacturer ....
64229	Daybreak Tobacco Manure	R. R. Lambert, Sulphur Well ....
64646	Daybreak Favorite	W. L. Anderson, Caneyville ....
64230 64231	Standard Crop and Tobacco Grower	A. W. Tarter, Columbia .... Birk & Price, Owensboro ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
9.70	1.20	10.90		1.03	0.57	1.60	1.94	5.91		42.4	64223
8.35	0.50	8.85		0.95	0.76	1.71	2.08	4.79		37.4	64644
8.00						*1.65*	*2.00*	*5.00*		*36.9*	
13.70	0.30	14.00		1.90	0.45	2.35	2.85	2.14		41.2	63459
12.00						*1.65*	*2.00*	*2.00*		*33.9*	
											63460
10.30	1.20	11.50		2.13	1.22	3.35	4.07	4.07		48.2	64224
10.20	0.80	11.00				3.64	4.42	3.38	0.96	50.5	64033
10.00						*3.29*	*4.00*	*4.00*		*46.7*	
15.20	4.70	19.90		0.70		0.70	0.85	0.60	0.42	31.9	63665
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*22.8*	
12.15	1.05	13.20				0.52	0.63	0.97		24.7	64226
11.35	1.65	13.00	0.39		0.22	0.61	0.74	2.33		28.3	64227
11.75	2.15	13.90				0.41	0.50	1.22		24.6	64645
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
15.80	3.10	18.90		0.78		0.78	0.95	0.50	0.92	33.9	63667
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*26.6*	
13 35	4.10	17.45		0.75		0.75	0.91	0.68	5.11	43 5	63668
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*35.6*	
12.75	1.00	13.75	0.58		0.32	0.90	1.09	1.07		28.1	64228
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*27.5*	
12.45	6 50	18.95		1.31		1.31	1.59	0.82	1.81	37.0	63670
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
10.25	1.00	11.25	0.38	0.39	0.30	1.07	1.30	1.58	0.42	28.2	64229
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
12.25	1.90	14.15				0.66	0.80	2.97		32.0	64646
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*32.0*	
10.05	3.25	13.30	0.32	0.45	0.38	1.15	1.40	3.49		33.8	64230
8.70	3.00	11.70	0.56		0.25	0.81	0.98	3.12		28.5	64231
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*30.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co.	
64232	Daybreak Tobacco Grower	J. R. Sower Hdw. Co., Frankfort ...
64233		Luther Chinn, Beaver Dam ....
63675	Daybreak Vegetable Gower	Manufacturer ....
64234	Daybreak Special Tobacco Grower	J. N. Sanderson, Mayfield ....
64238	Standard Grain Grower	J. S. Whitfill, Leitchfield ....
64239		Goodman Bros. Co., Shelbyville ......
64649		Grayson County Supply Co., Leitchfield
64240	Ammoniated Potash Ten	W. C. Stewart, Horse Cave ....
64241	Tobacco, Truck, and Tomato Fertilizer	Farmers' Union Supply Co., Bowling Green ....
64242		Barnett Bros., London ....
63695	Potato Maker and Tobacco Fertilizer	Manufacturer ....
64243	Standard Corn and Wheat Grower	C. A. Lamkin, Hodgenville ....
64244	Premium H. Gr. Fertilizer	Sam Carpenter & Co., Maysville .....
64245		Chiles-Thompson Grocery Co., Mt. Sterling ....
64246	Special Tobacco Maker	L. R. Hart, Big Clifty ....
64247		Lake Bros., Springfield ....
64249	Beef, Blood, and Bone	Grayson County Supply Co., Leitchfield ....
64650		Grayson County Supply Co., Leitchfield ....
64575	Loam Land Fertilizer	Terrell Bros., Bedford ....
64576	Mid-West High Grade Mixture	Terrell Bros., Bedford ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.80	1.10	**9.90**				1.65	2.00	2.07		29.8	64232
8.30	1.20	**9.50**	0.42	0.79	0.48	1.69	2.05	1.86		28.7	64233
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
10.40	7.10	17.50		2.18	0.29	2.47	3.00	2.78	2.94	50.4	63675
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*38.5*	
											63676
10.35	2.65	13.00	0.22		0.27	**0.49**	0.59	**4.17**		**32.0**	64234
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*6.00*	*39.0*	
10.10	1.55	**11.65**	0.29		0.35	0.64	0.78	1.17		**23.1**	64238
11.05	0.95	12.00	0.56		0.33	0.89	1.08	1.22		26.0	64239
10.15	1.75	**11.90**				0.92	1.12	1.42		25.7	64649
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*24.5*	
7.90	3.00	10.90	1.00			1.00	1.21	9.78		48.4	64240
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*10.00*	*48.5*	
9.70	2.50	12.20		0.52	0.91	1.43	1.74	1.17		27.6	64241
10.20	1.20	11.40	0.42	0.63	0.47	1.52	1.85	1.20		28.5	64242
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*28.0*	
12.50	7.00	19.50		2.39		2.39	2.90	0.68	1.02	33.8	63695
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*28.0*	
9.05	0.60	**9.65**	0.38	0.73	0.39	1.50	1.82	2.12		29.2	64243
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
10.40	1.40	**11.80**				1.67	2.03	1.92		31.9	64244
11.10	0.45	**11.55**	1.29		0.22	1.51	1.83	1.95		31.7	64245
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	
9.85	1.45	**11.30**	0.51		1.29	1.80	2.19	1.80		31.6	64246
9.80	1.40	**11.20**		1.20	0.43	1.63	1.98	2.05		**31.2**	64247
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	
8.45	1.85	**10.30**	0.29	0.62	0.37	**1.28**	1.55	2.04		**27.2**	64249
10.15	1.90	12.05	1.63			1.63	1.98	2.31		32.7	64650
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	
11.75	0.90	**12.65**	0.45	0.37	0.39	**1.21**	1.47	2.13		**31.6**	64575
12.00	*4.00*	*16.00*				*1.65*	*2.00*		*2.00*	*35.5*	
10.35	0.65	**11.00**	0.42	0.76	0.34	1.52	1.85	3.97		**36.8**	**64576**
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*38.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co.	
64254	Special Tobacco and Potato Grower	Bedford & Tuttle, Winchester ....
64255	High Grade Tobacco Grower	Sam Carpenter & Co., Maysville .....
64256		Grayson County Supply Co., Leitchfield ....
64796		Lancaster-Smith Seed Co., Owensboro
63994	2-8-3 Formula	Manufacturer ....
63995	A-1 High Grade Tobacco Grower	Manufacturer ....
64257	3-10-3 Formula	Chiles-Thompson Grocery Co., Mt. Sterling ....
64258	2-10-10 Formula	Guenther Hardware Co., Owensboro ..
63722	1st Prize Corn and Wheat Champion	Manufacturer ....
63723	1st Prize Corn, Wheat, and Oats Gr.	Manufacturer ....
63724	1st Prize Grain Maker	Manufacturer ....
63725	1st Prize Special	Manufacturer ....
63726	1st Prize Wheat and Grain Special	Manufacturer ....
63727	Blue Ribbon Corn and Wheat Grower	Manufacturer ....
63728	Blue Ribbon Tobacco Grower	Manufacturer ....
63729	1st Prize Formula	Manufacturer ....
64259	1st Prize Crop and Tobacco Grower	J. H. Dodson, Maysville ....
64260		Farmers' Union Supply Co., Russellville ....
63731	1st Prize Tobacco and Veg. Grower	Manufacturer ....

Complete Fertilizers.

Phosphoric Acid			Nitrogen				Equivalent to Ammonia	Potash		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
7.00	2.90	9.90	0.37	1.36	0.47	2.20	2.67	5.97		43.2	64254
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*46.4*	
7.00	1.20	8.20		0.83	2.19	3.02	3.67	4.36		42.2	64255
7.90	1.20	9.10	0.42	1.53	0.56	2.51	3.05	3.81		38.8	64256
5.60	2.20	8.10	1.57		1.70	3.27	3.97	3.99		40.9	64796
8.00	*4.00*	*12.00*				*3.29*	*4.00*		*4.00*	*45.3*	
11.10	7.70	18.80		2.65		2.65	3.22	1.60	2.08	46.8	63994
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*32.5*	
11.30	5.75	17.05		3.85		3.85	4.67	1.82	2.16	54.3	63995
8.00	*4.00*	*12.00*				*3.29*	*4.00*		*3.00*	*42.3*	
11.55	0.45	12.00	1.55		0.30	1.85	2.25	2.70		36.7	64257
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*40.4*	
10.10	2.50	12.60	1.03	0.24	0.23	1.50	1.82	9.03		52.2	64258
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*10.00*	*56.5*	
15.20	4.70	19.90		0.70		0.70	0.85	0.60	0.42	31.9	63722
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*22.8*	
15.05	6.00	21.05		0.57		0.57	0.69	0.44	0.97	32.6	63723
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
15.80	3.10	18.90		0.78		0.78	0.95	0.50	0.92	33.9	63724
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*26.6*	
13.35	4.10	17.45		0.75		0.75	0.91	0.68	5.11	43.5	63725
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*35.6*	
15.10	4.10	19.20		1.25		1.25	1.52	0.46	1.23	36.9	63726
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*27.5*	
12.45	6.50	18.95		1.31		1.31	1.59	0.82	1.81	37.0	63727
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
12.45	6.50	18.95		1.31		1.31	1.59	0.82	1.81	37.0	63728
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
13.50	4.70	18.20		1.25		1.25	1.52	0.98	2.55	40.2	63729
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*32.0*	
8.05	1.50	9.55		0.84		0.84	1.02	3.98		29.7	64259
10.45	3.10	13.55	0.52		0.30	0.82	1.00	2.30		28.7	64260
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*30.5*	
10.55	7.25	17.80		1.64	0.47	2.11	2.56	1.98	5.21	53.0	63731
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*6.00*	*39.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co.	
63968	4-4-1 Goods (For Lawns and Gardens)	Manufacturer ....
	Fox Chemical Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
64262	Fox Ideal Fertilizer	J. S. Whitfill, Big Clifty ....
64263		A. R. Blakely, Esto ....
64659		Lancaster-Smith Seed Co., Owensboro
63774	Fox Blood Bone Phosphate and Potash	Manufacturer ....
63775	Red Fox Grain and Grass Grower	Manufacturer ....
64264	Fox Soil Builder	Lancaster-Smith Seed Co., Owensboro
63777	Fox High Grade Special	Manufacturer ....
64265	Fox Wheat and Grain Special	T. Z. Leachman, Greensburg ....
64266	Fox Early Harvest	B. R. Bacon Hdw. Co., Frankfort ....
63780	Early Harvest Tobacco Grower	Manufacturer ....
64660	Fox Formula	L. H. Phillips, Bengal ....
64267	Fox Crop and Tobacco Grower	Foley, Holt & Collins, Russell Springs
63783	Fox Wheat and Corn Manure	Manufacturer ....
64268	Fox Tobacco Grower	W. C. Bonta, Pleasureville ....
64269		J. S. Whitfill, Big Clifty ....
63785	Fox Wheat and Corn Grower	Manufacturer ....
63786	Fox Vegetable Grower	Manufacturer ....
64273	Fox Special Tobacco Grower	T. Z. Leachman, Greensburg ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
6.55	2.15	8.70	1.81		1.40	3.21	3.90	2.25		36.7	63968
4.00	*0.10*	*4.10*				*3.29*	*4.00*	*1.00*		*28.8*	
11.45	1.05	**12.50**				0.31	0.38	0.45		**20.8**	64262
12.40	2.40	14.80				0.41	0.50	0.57		23.7	64263
11.40	2.50	13.90	0.64		0.31	0.95	1.15	1.26		27.6	64659
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*22.8*	
15.05	6.00	21.05		0.57		0.57	0.69	0.44	0.97	32.6	63774
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
15.05	6.00	21.05		0.57		0.57	0.69	0.44	0.97	32.6	63775
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
14.65	1.60	16.25				0.30	0.36	0.85		27.0	64264
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*26.6*	
13.35	4.10	17.45		0.75		0.75	0.91	0.68	5.11	43.5	63777
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*35.6*	
11.85	1.65	**13.50**	0.60		0.33	0.93	1.13	1.37		28.0	64265
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*27.5*	
9.90	1.30	**11.20**				0.81	0.98	2.06		**26.4**	64266
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
12.45	6.50	18.95		1.31		1.31	1.59	0.82	1.81	37.0	63780
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
11.50	2.00	13.50				0.74	0.90	3.06		31.7	64660
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*32.0*	
10.05	3.65	13.70	0.60	0.32	0.27	1.19	1.44	**2.27**		30.5	64267
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*30.5*	
10.45	8.75	19.20		2.30		2.30	2.79	1.46	1.12	40.7	63783
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
8.55	1.45	10.00				1.46	1.77	2.31		29.1	64268
8.40	0.70	**9.10**		0.63	0.76	1.39	1.69	1.84		**26.7**	64269
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
12.75	5.05	17.80		2.29		2.29	2.78	0.84	1.90	43.1	63785
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	
10.40	7.10	17.50		2.18	**0.29**	2.47	3.00	2.78	2.94	50.4	63786
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*38.5*	
8.35	0.95	**9.30**	0.42	0.66	0.35	1.43	1.74	4.68		**35.5**	64273
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*38.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Globe Fert. Co., Br. Federal Chem. Co. Inc., Louisville, Ky.	
64274	Kentucky Standard Tobacco Grower	I. K. Miller & Sons, Campbellsville ..
64275		A. J. Higdon, Clarkson ....
64276	Globe Good Grower Fertilizer	John Harned, Big Clifty ....
64277	Globe Blood Bone Phosphate and Potash	Williamsburg Hdw. Co., Williamsburg
64278		J. B. Benjamin & Son, Providence ..
64662		Burton & Pyles, Ella ....
64663		Hutcheson Bros., Auburn ....
64279	Globe Grain and Grass Grower	A. T. Warder, Epworth ....
64280		Hafendorfer-Thornton Co., Owensboro
64664		Hafendorfer-Thornton Co., Owensboro
64281	Globe Money Maker	Pearson & Breedlove, Franklin ......
63807	Globe High Grade Special	Manufacturer ....
63808	Globe Wheat and Grain Special	Manufacturer ....
64282	Progress Corn and Wheat Grower	Pearson & Breedlove, Franklin ......
64283	Progress Tobacco Grower	T. M. Zachary, Dove ....
64284		H. C. Rogers, Sewellton ....
64285	Braden Formula	Cunningham & Robertson, Webbs Cross Roads ....
64665		W. C. Stewart, Horse Cave ....
64286	Universal Crop and Tobacco Grower	Ben Hook, Brandenburg ....
63813	Eagle Wheat and Corn Grower	Manufacturer ....
64287	Big 4 Tobacco Grower	I. K. Miller & Sons, Campbellsville ..
64288		Hafendorfer-Thornton Co., Owensboro
63815	Globe Wheat Grower	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.50	0.95	9.45	0.43	0.80	0.39	1.62	1.97	4.92		37.6	64274
8.90	0.80	9.70	0.83	0.53	0.37	1.73	2.10	5.02		39.1	64275
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*38.5*	
12.45	0.80	13.25				0.33	0.40	0.57		22.7	64276
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*22.8*	
11.90	1.60	13.50				0.31	0.38	0.97		23.3	64277
12.30	0.85	13.15				0.44	0.53	1.42		25.7	64278
12.00	2.25	14.25				0.43	0.52	0.74		23.7	64662
12.00	2.40	14.40				0.44	0.53	1.32		25.6	64663
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
11.80	2.10	13.90				0.51	0.62	1.02		24.7	64279
13.25	1.90	15.15				0.41	0.50	0.79		25.5	64280
12.95	2.00	14.95	0.41			0.41	0.50	1.29		26.6	64664
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
14.05	1.85	15.90				0.44	0.53	0.89		27.1	64281
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*26.6*	
13.35	4.10	17.45		0.75		0.75	0.91	0.68	5.11	43.5	63807
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*35.6*	
15.10	4.10	19.20		1.25		1.25	1.52	0.46	1.23	36.9	63808
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*27.5*	
10.60	2.10	12.70				0.84	1.02	1.98		27.7	64282
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
11.30	0.95	12.25				0.88	1.07	2.06		28.8	64283
11.65	1.70	13.35				0.83	1.01	1.86		28.7	64284
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
12.15	1.65	13.80				0.83	1.01	2.38		31.0	64285
12.35	1.85	14.20				0.75	0.91	3.03		32.9	64665
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*32.0*	
8.65	1.00	9.65		0.31	0.43	0.74	0.89	3.88		29.5	64286
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*30.5*	
10.45	8.75	19.20		2.30		2.30	2.79	1.46	1.12	40.7	63813
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
9.25	0.50	9.75	0.47	0.91	0.40	1.78	2.16	2.26		31.5	64287
9.75	0.45	10.20	0.48	1.17	0.38	2.03	2.46	1.84		32.5	64288
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
12.75	5.05	17.80		2.29		2.29	2.78	0.84	1.90	43.1	63815
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Globe Fertilizer Co.	
64248	Kentucky Tobacco Maker	Collins Hardware Co., Frankfort ..
64289		John Harned, Big Clifty ....
63817	Globe Soluble Vegetable Manure	Manufacturer ....
63997	Globe Bone Phosphate Dust	Manufacturer ....
63998	Big Spread Tobacco Mixture	Manufacturer ....
	Groves' Fert. Works, Cincinnati, O.	
64294	Groves Standard	J. C. Everett & Co., Maysville ......
64578		J. C. Bowles, Jeffersontown ....
64670		Aaron Moore, Leitchfield ....
64295	Harvest King	J. F. Collings, Shepherdsville ....
64296		S. V. Kissee, Ingle ....
64297	Economy Brand	J. F. Collings, Shepherdsville ....
64298	Tobacco Special	S. V. Kissee, Somerset ....
64299		J. F. Collings, Shepherdsville ....
64797		J. F. Collings, Shepherdsville ....
64300	Special Truck Grower	J. F. Collings, Shepherdsville ....
64301		J. C. Bowles, Jeffersontown ....
64671		J. C. Everett & Co., Maysville ......
64305	Half and Half (Bone Mixture)	S. V. Kissee, Ingle ....
64306		Aaron Moore, Leitchfield ....
64672		Aaron Moore, Leitchfield ....
64673		J. C. Everett & Co., Maysville ......
64307	Bone and Potash Mixture (Bone Mixture)	J. O. McAninch, Joyce ....
	Hall Seed Co., Louisville, Ky.	
63565	Halco Tobacco Grower	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.35	1.40	**11.75**				1.60	1.94	1.93		31.5	64248
10.30	0.60	**10.90**	0.44	0.52	0.44	1.40	1.70	2.06		**30.3**	64289
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	
10.40	7.10	17.50		2.18	0.29	2.47	3.00	2.78	2.94	50.4	63817
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*38.5*	
13.55	6.35	19.90	1.36			1.36	1.65	1.46	0.37	36.5	63997
9.00	*4.00*	*13.00*				*0.82*	*1.00*		*1.00*	*23.0*	
11.85	8.25	20.10		2.15		2.15	2.61	1.94		39.8	63998
8.00	*8.00*	*16.00*				*1.23*	*1.50*		*0.50*	*24.1*	
10.70	0.95	11.65		0.81	0.60	1.41	1.71	1.69		30.0	64294
10.95	1.05	12.00		1.00	0.58	1.58	1.92	2.17		32.8	64578
9.70	2.55	12.25				**1.20**	1.46	2.70		30.9	64670
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*2.00*		*31.3*	
9.00	0.70	9.70		0.59	0.44	1.03	1.25	1.19		23.5	64295
9.00	1.00	10.00		0.39	0.54	0.93	1.13	1.04		22.6	64296
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	
10.30	1.10	11.40		0.55	0.35	0.90	1.09	1.34		25.3	64297
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*23.3*	
8.40	0.70	9.10		0.25	0.46	0.71	0.86	4.34		30.2	64298
8.80	0.95	9.75		0.24	0.36	0.60	0.73	5.42		33.4	64299
8.80	1.40	10.20				0.87	1.06	4.65		32.9	64797
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*29.3*	
8.75	1.20	9.95		0.70	0.91	1.61	1.95	8.09		47.5	64300
9.55	1.15	10.70		1.01	**1.18**	2.19	2.66	**4.98**		**42.9**	64301
8.00	1.70	9.70		0.48	1.06	1.54	1.87	**7.06**		**43.1**	64671
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*8.00*		*46.3*	
9.90	6.60	16.50		0.56	1.13	1.69	2.05	2.07		33.8	64305
10.30	6.65	16.95		0.60	0.80	1.40	1.70	2.02		32.6	64306
7.95	8.45	16.40		0.42	0.97	1.39	1.69	2.17		30.2	64672
10.10	8.60	18.70		0.86	0.93	1.79	2.17	1.84		34.9	64673
8.00	*8.00*	*16.00*				*1.65*	*2.00*	*2.00*		*31.1*	
11.55	6.55	18.10				0.74	0.90	5.52		41.0	64307
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*5.00*		*38.9*	
10.25	3.05	13.30				0.90	1.09	2.23		28.7	63565
10.00	*1.00*	*11.00*				*0.82*	*1.00*		*2.00*	*26.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Hall Seed Co.	
63570	Halco Special Tobacco Grower	Manufacturer ....
63571	Halco Potato and Tobacco Grower	Manufacturer ....
	Hopkins Fertilizer Co., New Albany, Ind.	
63862	Kentucky Tobacco Grower	Manufacturer ....
63866	Potato and Tobacco Grower No. 1	Manufacturer ....
64315	Wheat and Corn Grower No. 2	Conner, Hayden & Co., Bardstown ..
64316		L. C. Goering & Son, Hawesville ....
64681		A. G. Miller, Magnolia ....
64317	Tobacco Bed and Field Mixture	J. Von Grunigen, Nicholasville ......
64318		A. G. Miller, Magnolia ....
64319	H. Gr. Tobacco Grower	Floyd Nealy, Glasgow ....
63870	Potato and Tobacco Grower	Manufacturer ....
64320	Superior	J. J. Eskridge, Clarkson ....
64321		Conner, Hayden & Co., Bardstown ..
64682		Jim Hill, St. John ....
64322	Half and Half No. 1	J. J. Eskridge, Clarkson ....
64683		J. J. Eskridge, Clarkson ....
64684		Sam Walker, Big Clifty ....
64323	Tobacco Special	D. A. Davis & Son, Jeffersontown ..
64324		L. C. Goering & Son, Hawesville ...
64038	Potato Grower	
64532	General Crop Grower	

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.55	1.95	10.50				0.52	0.63	0.70	0.33	19.8	63570
8.00	*1.00*	*9.00*				*0.41*	*0.50*		*1.00*	*17.9*	
9.10	1.50	10.60		1.22	0.60	1.82	2.21	3.53		35.8	63571
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*3.00*		*31.3*	
5.90	0.45	6.35		2.19		2.19	2.66	3.23		31.9	63862
6.00	*2.00*	*8.00*				*1.65*	*2.00*	*2.00*		*25.7*	
11.45	0.70	12.15		1.45		1.45	1.76	2.39		33.3	63866
11.00	*2.00*	*13.00*				*0.82*	*1.00*	*2.00*		*28.2*	
10.25	1.90	12.15	0.39		0.22	0.61	0.74	0.66	0.61	23.6	64315
12.95	1.95	14.90	0.25		0.24	0.49	0.59	1.22		26.8	64316
10.15	0.80	10.95	0.58			0.58	0.70	0.48	0.64	22.4	64681
10.00	*2.00*	*12.00*				*0.41*	*0.50*	*1.00*		*21.3*	
11.50	2.85	14.35	0.47	0.45	1.26	2.18	2.65	3.03		40.6	64317
12.50	3.10	15.60		1.05	1.45	2.50	3.04	2.81		43.4	64318
10.00	*2.00*	*12.00*				*2.47*	*3.00*	*3.00*		*39.6*	
9.15	4.85	14.00	0.21		0.68	0.89	1.08	1.14		24.4	64319
8.00	*2.00*	*10.00*				*0.82*	*1.00*	*1.00*		*20.7*	
12.15	0.55	12.70		0.99		0.99	1.20	1.30		28.3	63870
11.00	*2.00*	*13.00*				*0.82*	*1.00*	*1.00*		*25.2*	
11.50	1.80	13.30	0.68		0.87	1.55	1.88	3.89		38.9	64320
11.20	2.25	13.45		0.53	1.18	1.71	2.08	4.18		40.5	64321
10.00	3.50	13.50				1.60	1.94	3.78		37.3	64682
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*4.00*		*37.7*	
11.00	3.45	14.45		0.55	1.35	1.90	2.31	1.42		33.5	64322
7.95	4.80	12.75				1.78	2.16	1.47		28.9	64683
7.45	5.80	13.25				1.74	2.11	1.42		28.4	64684
6.00	*7.00*	*13.00*				*1.65*	*2.00*	*1.00*		*24.7*	
9.95	1.15	11.10	0.25	0.44	0.22	0.91	1.10	3.42		31.1	64323
9.05	0.75	9.80	0.91			0.91	1.10	3.01		28.4	64324
8.00	*2.00*	*10.00*				*0.82*	*1.00*	*3.00*		*26.7*	
											64038
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*3.00*		*31.7*	
											64532
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*2.00*		*34.7*	

Table I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	International Agr'l Corp., Inc., Cincinnati, O.	
63410	I. A. C. Special Tobacco Grower	Manufacturer ....
64327	I. A. C. A-1 Tobacco Fertilizer	C. M. Langdon, Science Hill ....
64328		J. W. Bratcher, Berea ....
63412	I. A. C. High Grade Fertilizer	Manufacturer ....
64329	I. A. C. Standard Fertilizer	J. B. Stone, Leitchfield ....
63414	I. A. C. Farmers' Favorite Manure	Manufacturer ....
64330	I. A. C. Old Kentucky Special	R. H. Lisle, Clarkson ....
64331		C. M. Langdon, Science Hill ....
64689		C. M. Langdon, Science Hill ....
63416	I. A. C. Complete Manure	Manufacturer ....
64332	I. A. C. Wheat and Corn Grower	J. B. Stone, Leitchfield ....
64690		C. M. Langdon, Science Hill ....
63429	Buffalo Tobacco and Potato Grower	Manufacturer ....
64337	Buffalo H. Gr. Tobacco Special	W. E. Ellis & Bro., Hartford ....
64338		R. F. Collier, Paris ....
63431	Buffalo High Grade Special	Manufacturer ....
64695	Buffalo Tobacco and Corn Grower	J. W. Hardyman, Mt. Carmel ....
64339	Buffalo Kentucky Standard	Tarter, Ham & Co., Somerset ....
64340		London Hardware Co., London ......
64696		G. W. Richardson, Somerset ....
64341	Buffalo Corn and Grain Grower	R. Y. Ballard, Waynesburg ....
64342		Tarter, Ham & Co., Somerset ....
64697		Coffey & Van Hook, Moreland ......
63435	Buffalo Complete Fertilizer	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.00	2.05	12.05	1.01	0.42	1.76	3.19	3.87	1.00	3.09	47.2	63410
8.00	*4.00*	*12.00*				*3.29*	*4.00*		*4.00*	*45.3*	
8.60	3.80	12.40	0.43	0.21	1.13	1.77	2.15	1.78	3.13	39.8	64327
8.40	1.50	9.90	0.64		0.82	1.46	1.77	5.17		37.5	64328
7.00	*4.00*	*11.00*				*1.65*	*2.00*		*5.00*	*37.0*	
12.90	2.40	15.30	0.55	0.38	0.84	1.77	2.15	2.19		37.5	63412
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*35.5*	
8.70	4.35	13.05				1.49	1.81	2.48		31.2	64329
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*29.5*	
11.10	4.40	15.50				0.94	1.14	0.96	2.43	34.2	63414
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*3.00*		*30.9*	
8.35	4.35	12.70				0.86	1.04	2.33		26.4	64330
9.05	4.05	13.10				0.90	1.09	2.19		27.2	64331
8.85	3.15	12.00	0.93		0.30	1.23	1.49	2.16		28.4	64689
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*2.00*		*24.9*	
9.10	4.25	13.35	0.43	0.20	0.47	1.10	1.34	1.58		26.7	63416
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*1.00*		*21.9*	
11.40	4.80	16.20				0.48	0.58	1.09		25.2	64332
11.35	4.20	15.55				0.50	0.61	1.28		25.6	64690
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*23.9*	
10.30	2.50	12.80		0.31	2.00	2.31	2.80	1.06	5.53	50.1	63429
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*46.4*	
11.00	2.10	13.10	0.56	0.29	1.03	1.88	2.28		4.34	41.6	64337
11.45	2.40	13.85				1.59	1.93	4.33		40.7	64338
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*38.5*	
12.90	2.40	15.30	0.55	0.38	0.84	1.77	2.15	2.19		37.5	63431
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*35.5*	
9.05	0.85	9.90	0.96		0.60	1.56	1.89	2.17		29.8	64695
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
11.45	2.70	14.15				0.68	0.83	3.23		32.0	64339
11.70	2.75	14.45				0.81	0.98	2.87		32.1	64340
9.90	1.10	11.00	0.61		0.33	0.94	1.14	3.05		30.1	64696
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*3.00*		*30.9*	
9.60	6.40	16.00				0.83	1.01	2.34		29.0	64341
9.50	6.75	16.25				0.84	1.02	2.21		28.6	64342
8.15	3.65	11.80	0.21	0.34	0.35	0.90	1.09	2.33		26.1	64697
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*2.00*		*24.9*	
9.10	4.25	13.35	0.43	0.20	0.47	1.10	1.34	1.58		26.7	63435
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*1.00*		*21.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	International Agr'l Corp.	
63436	Buffalo Corn and Oats Special	Manufacturer ....
	The Jarecki Chemical Co., (Armour owned) Cincinnati, O.	
63575	Lake Erie Guano with Phosphate and Potash	Manufacturer ....
63576	Number One Formula	Manufacturer ....
64347 64348	Little Giant	C. L. & F. F. Dudley, Flemingsburg . J. E. Cain, Hogue ....
64349	Tobacco and Potato Food	G. C. Anderson, Glasgow ....
63579	Favorite Grain Grower	Manufacturer ....
63580	Middle West Formula	Manufacturer ....
64350	Double Standard	W. G. Nunelley, Somerset ....
64351	Sure Crop	J. C. Everett & Co., Maysville ......
63583	Grain Grower	Manufacturer ....
63592	Big Tobacco Maker	Manufacturer ....
63593	Burley Tobacco Grower	Manufacturer ....
64354	Special Tobacco Grower	J. E. Cain, Hogue ....
63595	Tobacco and Truck Grower	Manufacturer ....
64355	Jarecki's 2-16-2 Fertilizer	J. C. Everett & Co., Maysville ......
63599	Indian Br. Tobacco and Potato Food	

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.80	4.15	15.95	0.27		0.31	0.58	0.70	1.24		26.6	63436
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*24.0*	
13.10	1.30	14.40		0.21	0.79	1.00	1.21	1.13		29.6	63575
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	
10.30	3.15	13.45		0.38	0.60	0.98	1.19	2.36		29.7	63576
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*26.3*	
9.40	3.20	12.60		0.43	0.41	0.84	1.02	1.16		23.9	64347
10.65	3.40	14.05		0.70	0.39	1.09	1.32	1.50		28.4	64348
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*23.3*	
14.90	2.10	17.00				0.20	0.24		0.76	26.7	64349
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*29.3*	
7.60	1.80	9.40		0.37	0.61	0.98	1.19	1.78		23.3	63579
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	
13.00	0.90	13.90		1.33	0.61	1.94	2.36	2.13		37.9	63580
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*34.3*	
16.35	0.50	16.85		0.88	0.73	1.61	1.95	2.12		40.8	64350
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
10.30	2.20	12.50	0.27	1.33		1.60	1.94	4.33		38.9	64351
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	
7.90	1.80	9.70		0.72	0.86	1.58	1.92	2.17		28.6	63583
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*28.3*	
8.75	2.20	10.95	0.58	0.46	0.67	1.71	2.08	1.16	2.91	36.5	63592
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*34.3*	
8.80	1.55	10.35	0.51	1.18	0.86	2.55	3.10	2.32	3.90	47.8	63593
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*45.2*	
8.40	3.70	12.10		0.48	0.43	0.91	1.10	1.32		23.5	64354
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*20.3*	
6.10	1.00	7.10		1.14	0.57	1.71	2.08	6.42		39.1	63595
6.00	*1.00*	*7.00*				*1.65*	*2.00*	*6.00*		*37.3*	
16.85	2.45	19.35		1.07	0.78	1.85	2.25	2.23		44.1	64355
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
9.00	*1.00*	*10.00*				*2.47*	*3.00*		*3.00*	*37.7*	63599

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Jarecki Chem. Co.	
64356	Indian Br. Tobacco and Potato Fertilizer	Eminence Milling Co., Eminence ....
	The Kaufman Fertilizer Co. (owned and operated by Armour Fertilizer Works) Cincinnati, O.	
64357	Corn, Wheat, and Oats Grower	James Roe, Mouth of Laurel ....
63625	Harvest King	Manufacturer ....
64358	Banner Crop Grower	James Roe, Mouth of Laurel ....
64359	Tobacco and Potato Grower	James Roe, Mouth of Laurel ....
63628	Favorite Grain Grower	Manufacturer ....
63629	Complete Ration	Manufacturer ....
64360	Sure Crop	Pleasureville Supply Co., N. Pleasureville ....
63631	Grain Grower	Manufacturer ....
63640	Big Tobacco Maker	Manufacturer ....
64362	Burley Tobacco Grower	James Roe, Mouth of Laurel ....
64363	Special Tobacco Grower	James Roe, Mouth of Laurel ....
63643	Double Standard	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.30	1.55	11.85		1.85	0.45	2.30	2.79	3.22	2.09	45.8	64356
9.00	*1.00*	*10.00*				*2.47*	*3.00*		*5.00*	*43.7*	
11.35	0.70	12.20				0.91	1.10	1.26		26.6	64357
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	
10.30	3.15	13.45		0.38	0.60	0.98	1.19	2.36		29.7	63625
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*26.3*	
11.10	0.70	11.80		0.53	0.35	0.88	1.07	1.36		26.3	64358
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*23.3*	
8.90	0 70	9.60		0.29	1.03	1.32	1.60	3.10	1.61	35.7	64359
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*29.3*	
7.60	1.80	9.40		0.37	0.61	0.98	1.19	1.78		23.3	63628
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	
13.00	0.90	13.90		1.33	0.61	1.94	2.36	2.13		37.9	63629
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*34.3*	
10.45	3.00	13.45		0.27	1.39	1.66	2.02	4.42		40.1	64360
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	
7.90	1.80	9.70		0.72	0.86	1.58	1.92	2.17		28.6	63631
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*28.3*	
8.75	2.20	10.95	0.58	0.46	0.67	1.71	2.08	1.16	2.91	36.5	63640
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*34.3*	
8.70	2.20	10.90	0.87	0.65	0.88	2.40	2.91	**3.74**	**1.10**	**42.9**	64362
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*45.2*	
8.15	0.70	8.85	0.42	0.20	0.35	0.97	1.18		1.41	22.6	64363
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*20.3*	
16 40	2.25	18.65		0.76	0.98	1.74	2.11	2.11		42.3	63643
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Kaufman Fertilizer Co.	
63644	Kaufman's 2-16-2 Fertilizer	Manufacturer ....
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
63836	O. K. Special Mixture	Manufacturer ....
64364		J. L. Siler, Corbin ....
64701	O. K. Grain Grower	Smith & Smith, Shepherdsville ......
64702		C. M. Hill, Cecilia ....
64365	O. K. Corn, Wheat, and Oats Grower	Albert Hayes, Brodhead ....
63839	O. K. Old Reliable	Manufacturer ....
63840	O. K. Special	Manufacturer ....
63841	O. K. Wheat and Grain Special	Manufacturer ....
64367	O. K. Corn and Wheat Grower	Sam Carpenter & Co., Maysville ....
64368		Guenther Hardware Co., Owensboro .
63843	O. K. Tobacco Fertilizer	Manufacturer ....
64703	O. K. High Grade Mixture	C. M. Hill, Cecilia ....
63845	O. K. Crop and Tobacco Grower	Manufacturer ....
64369	Golden Leaf Tobacco Grower	L. H. Hart, Big Clifty ....
63847	O. K. Tobacco and Vegetable Grower	Manufacturer ....
	Louisville Fertilizer Co. (Armour owned), Louisville, Ky., Cincinnati, O., and Nashville, Tenn.	
64373	Louisville Standard	M. B. Wallingford, Mt. Carmel ......
64707		S. A. Browning, Vanceburg ....
64708		M. B. Wallingford, Mt. Carmel ......

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
16.40	2.25	18.65		0.76	0.98	1.74	2.11	2.11		42.3	63644
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
15.20	4.70	19.90		0.70		0.70	0.85	0.60	0.42	31.9	63836
12.60	2.45	15.05				0.43	0.52	0.52		24.0	64364
11.50	*4.00*	*15.50*				*0.41*	*0.50*		*0.50*	*22.8*	
11.65	0.45	12.10				0.42	0.51	1.37		24.3	64701
12.25	2.00	14.25				0.39	0.47	1.12		24.9	64702
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
11.25	1.15	12.40				0.42	0.51	1.47		24.3	64365
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
15.80	3.10	18.90		0.78		0.78	0.95	0.50	0.92	33.9	63839
13.00	*4.00*	*17.00*				*0.41*	*0.50*		*1.00*	*26.6*	
13.35	4.10	17.45		0.75		0.75	0.91	0.68	5.11	43.5	63840
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*5.00*	*35.6*	
15.10	4.10	19.20		1.25		1.25	1.52	0.46	1.23	36.9	63841
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*27.5*	
10.45	0.90	11.35				0.92	1.12	1.89		27.2	64367
10.80	0.90	11.70				0.83	1.01	1.96		27.4	64368
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
12.45	6.50	18.95		1.31		1.31	1.59	0.82	1.81	37.0	63843
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	
12.50	1.80	14.30				0.58	0.70	2.06		29.1	64703
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*32.0*	
11.00	8.80	19.80		1.29		1.29	1.57	1.30	3.26	41.4	63845
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*4.00*	*30.5*	
9.70	1.00	10.70				1.68	2.04	1.69		30.1	64369
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
10.55	7.25	17.80		1.64	0.47	2.11	2.56	1.98	5.21	53.0	63847
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*6.00*	*39.0*	
9.35	0.95	10.30				0.95	1.15	1.56		24.8	64373
8.20	3.20	11.40		0.42	0.45	0.87	1.06	1.14		22.2	64707
8.70	0.30	9.00		0.24	0.52	0.76	0.92	1.42		22.0	64708
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Co.	
63464	Stock Yard Guano	Manufacturer ....
64374 64709	Wheat, Corn, and Oats	D. E. Patterson, Hodgenville .... Lewis & Drye, Lebanon ....
64375 64376	Grain Grower	Henry & Harvey, Carlisle .... M. B. Wallingford, Mt. Carmel ......
64710 64800	Blood, Phosphate, and Bone	Copple Bros., Guthrie .... Harrodsburg Impl. Co., Harrodsburg.
64579 64711	Golden Crop Grower	E. F. Humphrey, Dry Ridge .... Copple Bros., Guthrie ....
64377 64378	Purdue's Choice	Durham Produce Co., Columbia ...... Lewis & Drye, Lebanon ....
64379	H. Gr. Potato Grower	Henry & Harvey, Carlisle ....
64380	Truck Gardeners Pride	J. A. Bennett, Taylorsville ....
64381	Louisville Tobacco Grower	D. L. D. Sandefur, Beaver Dam ....
64383 64384	Blue Grass Tobacco Grower	J. A. Bennett, Taylorsville .... M. B. Wallingford, Mt. Carmel ......
64385 64386	Special Tobacco Grower	M. B. Wallingford, Mt. Carmel ...... Elkin & Kimmel, Greenville ....
64387	Special Corn and Tobacco Maker	Walter Young Coal Co., Owingsville .

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
9.80	3.30	13.10		0.48	0.56	1.04	1.26	1.12		25.6	63464
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*23.3*	
12.40	0.90	13.30				0.77	0.93	1.26		27.3	64374
13.10	0.30	13.40		0.46	0.34	0.80	0.97	0.95		27.4	64709
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	
9.65	1.00	10.65	1.49		0.47	1.96	2.38	2.64		34.6	64375
9.30	0.80	10.10	1.18		0.40	1.58	1.92	2.52		31.3	64376
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*28.3*	
11.10	1.00	12.10		0.67	0.79	1.46	1.76	1.64	0.80	33.1	64710
14.10	0.60	14.70		0.72	0.79	1.51	1.83	2.23		37.1	64800
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*34.3*	
9.60	3.30	12.90		0.37	1.16	1.53	1.86	3.69		36.0	64579
10.70	1.30	12.00		0.53	0.67	1.20	1.46	3.66		34.8	64711
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	
11.25	1.00	12.25	0.91	0.35	0.42	1.68	2.04	4.83		41.9	64377
12.50	0.80	13.30	0.57	0.53	0.60	1.70	2.06	6.09		47.5	64378
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*6.00*		*46.3*	
8.75	0.90	9.65	1.16	0.20	0.40	1.76	2.14	2.28	1.87	36.5	64379
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*4.00*		*34.3*	
9.20	1.05	10.25	1.11	0.98	1.09	3.18	3.86	2.82	0.61	43.6	64380
8.00	*1.00*	*9.00*				*3.29*	*4.00*	*3.00*		*41.1*	
9.45	7.35	16.80		0.70	0.75	1.45	1.76	2.23		32.5	64381
10.00	*1.00*	*11.00*				*0.82*	*1.00*		*2.00*	*26.3*	
9.30	0.70	10.00	0.52		0.28	0.80	0.97	0.84	1.45	25.8	64383
9.90	1.00	10.90	0.57		0.36	0.93	1.13	1.48	1.78	30.6	64384
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*3.00*	*26.3*	
8.80	1.00	9.80	0.47	0.20	0.34	1.01	1.23	1.35		23.7	64385
9.95	7.15	17.10		0.32	0.31	0.63	0.76	1.28		25.4	64386
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*20.3*	
12.55	1.30	13.85		0.27	0.71	0.98	1.19	1.16		28.7	64387
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Works	
64388	Tobacco and Potato Grower	Yopp Seed Co., Paducah ....
64713		Yopp Seed Co., Paducah ....
64389	Big Tobacco Maker	M. B. Wallingford, Mt. Carmel ......
64390		Henry & Harvey, Carlisle ....
64391	Burley Tobacco Grower	D. E. Patterson, Hodgenville ....
64392		M. B. Wallingford, Mt. Carmel ......
64714		M. B. Wallingford, Mt. Carmel ......
63486	Plant Bed Special	Manufacturer ....
64398	Double Standard	S. A. Browning, Vanceburg ....
64718		Lewis & Drye, Lebanon ....
63745	Potato and Tobacco Maker	
63860	Big Giant	Manufacturer ....
	Morris & Co., Chicago Ill.	
64830	Morris Big Three	Manufacturer ....
64834	Morris Big Eight	Manufacturer ....
64835	Morris Big Nine	Manufacturer ....
64836	Morris Big Ten	Manufacturer ....
64839	Morris Big Fourteen	Manufacturer ....
	Mt. Pleasant Fert. Co., Mt. Pleasant, Tenn.	
63647	V. C. Plant Food	

Complete Fertilizers.

Phosphoric Acid			Nitrogen					Potash			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number
8.80	3.00	11.80		0.72	0.79	1.51	1.83	1.14		26.9	64388
8.85	2.80	11.65		0.73	0.71	1.44	1.75	0.98		26.0	64713
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*1.00*		*25.3*	
9.20	0.70	9.90	1.21		0.49	1.70	2.06	**1.98**	**2.13**	**36.6**	**64389**
9.80	0.60	10.40	1.28		0.42	1.70	2.06	2.60	1.03	36.0	64390
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*34.3*	
9.20	1.05	10.25	1.11	0.72	0.62	2.45	2.97	3.64	3.08	49.1	64391
10.15	1.20	11.35	0.93	0.81	0.70	2.44	2.96	2.96	2.62	47.2	64392
9.00	0.60	9.60		0.49	1.90	2.39	2.90	**4.69**		**42.2**	64714
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*45.2*	
12.25	1.35	13.60				2.77	3.36	1.62	0.53	42.0	63486
12.00	*1.00*	*13.00*				*2.47*	*3.00*		*2.00*	*39.2*	
15.45	1.85	17.30		0.98	0.70	1.68	2.04	2.41		41.2	64398
16.50	1.05	17.55		1.08	0.53	1.61	1.95	**2.27**		**41.6**	**64718**
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
											63745
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*29.3*	
10.75	0.85	11.60		0.48	1.32	1.80	2.19		16.21	75.9	63860
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*15.00*	*70.3*	
9.25	0.90	10.15				1.16	1.41	1.46	2.11	31.9	64830
9.00	*1.00*	*10.00*				*0.82*	*1.00*		*3.00*	*27.8*	
8.05	0.60	8.65				1.19	1.44	0.76	0.44	23.1	64834
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*20.3*	
13.65	2.40	16.05				1.15	1.40	0.68	0.48	31.8	64835
12.00	*1.50*	*13.50*				*0.82*	*1.00*		*1.00*	*26.5*	
8.70	2.05	10.75				1.85	2.25	1.32	1.24	32.7	64836
8.00	*1.50*	*9.50*				*1.65*	*2.00*		*2.00*	*28.5*	
12.10	1.90	14.00	0.99		1.31	2.30	2.79	1.58	0.80	39.9	64839
12.00	*1.50*	*13.50*				*1.65*	*2.00*		*2.00*	*34.5*	
											63647
8.00	*2.00*	*10.00*				*4.94*	*6.00*		*3.00*	*51.4*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Mt. Pleasant Fert. Co.	
64402	Mt. Pleasant Special Tobacco Gr.	Jackson Hdw. & Grocery Co., Dixon .
64403	Mt. Pleasant Black Patch Tobacco Grower	W. B. Davis, Princeton ....
64404	Mt. Pleasant H. Gr. Tobacco Grower	Farmers' Union Supply Co., Franklin
64406	Mt. Pleasant Superior Burley Grower	Hudson & Farnau, Lancaster ....
63660	Mt. Pleasant Burley Special	Manufacturer ....
63662	Mt. Pleasant Corn Grower	Manufacturer ....
63664	Grigsby Special	Manufacturer ....
64407	Mt. Pleasant 10-4-4	Cadiz Hardware Co., Cadiz ....
64528	Mt. Pleasant Wheat Grower	Manufacturer ....
64530	Black Patch Grain Grower	Manufacturer ....
	The Peerless Chemical Co., Columbia, Tenn.	
64027	Peerless 2-8-2	Manufacturer ....
	Poultry Feed Co., Chicago, Ill.	
63244	Premier Brand Pulverized Poultry Manure	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.10	6.50	16.60		0.55	0.63	1.18	1.43	1.64		29.8	64402
8.00	*2.00*	*10.00*				*1.23*	*1.50*		*1.50*	*24.7*	
8.65	11.20	19.85				0.51	0.62	1.24		24.2	64403
7.00	*2.00*	*9.00*				*0.41*	*0.50*		*1.00*	*16.8*	
11.55	1.55	13.10		0.86	0.61	1.47	1.78	2.85		35.4	64404
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*3.00*	*31.7*	
10.40	3.70	14.10		1.04	1.02	2.06	2.50	2.13		35.8	64406
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*2.00*	*28.7*	
8.70	5.35	14.05	0.57		0.22	0.79	0.96	4.68		34.0	63660
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*4.00*	*29.7*	
9.15	9.55	18.70				0.60	0.73	1.40		25.4	63662
7.00	*2.00*	*9.00*				*0.41*	*0.50*		*1.00*	*16.8*	
9.20	5.20	14.40	1.07			1.07	1.30	1.36		26.4	63664
10.00	*2.00*	*12.00*				*0.82*	*1.00*		*1.00*	*23.7*	
12.85	2.50	15.35		2.93	0.33	3.26	3.96	4.11		52.2	64407
10.00	*8.00*	*18.00*				*3.29*	*4.00*		*4.00*	*49.9*	
8.75	13.00	21.75		1.07	0.25	1.32	1.60	1.70		31.4	64528
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*1.50*	*25.5*	
7.35	16.70	24.05				0.40	0.49	1.03		23.2	64530
7.00	*9.00*	*16.00*				*0.41*	*0.50*		*1.00*	*19.6*	
12.20	1.05	13.25		3.23	0.41	3.64	4.42	2.64		48.5	64027
8.00						*1.65*	*2.00*	*2.00*		*27.9*	
2.35	0.20	2.55		0.60	4.32	4.92	5.97	0.98	0.56	37.8	63244
1.70	*1.00*	*2.70*				*4.10*	*4.98*		*1.30*	*31.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Price Chem. Co., Inc., Louisville, Ky.	
64410	Special Corn and Wheat Fertilizer	Johnson & Viers, Elizabethtown ....
64411		H. F. Upchurch, Monticello ....
64729		J. C. Everett & Co., Maysville ....
64730		Johnson & Viers, Elizabethtown ....
63944	Good Grain Grower	Manufacturer ....
64412	Grain and Grass Grower	W. A. Johnson, Brodhead ....
63946	Universal Crop Fertilizer	Manufacturer ....
63947	Walter Crady's Vegetable, Potato, and Tobacco Special	Manufacturer ....
64413	Ky. Blue Grass Tobacco Special	Pleasureville Impl. Co., N. Pleasureville
64821	High Grade Special	G. M. Hedrick, Burnside ....
64414	Extra H. Gr. Tobacco Fertilizer	W. A. Johnson, Brodhead ....
64803		W. W. Higginbotham, Monticello ....
64415	Old Time Grain Fertilizer	W. A. Johnson, Brodhead ....
64416		Oakley D. Bertram, Cooper ....
64804		W. W. Higginbotham, Monticello ...
64417	Old Time Tobacco Fertilizer	J. C. Everett & Co., Maysville ......
64418		E. L. Cox, Cub Run ....
63953	Truck and Tobacco Fertilizer	Manufacturer ....
63954	Bright Tobacco Special	Manufacturer ....
63955	General Crop Fertilizer	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
11.50	1.70	13.20	0.58			0.58	0.70	1.12		24.8	64410
12.40	5.50	17.90				0.53	0.64	1.05		27.1	64411
12.40	1.00	13.40	0.43		0.25	0.68	0.83	1.11		26.4	64729
12.30	0.50	12.80	0.27		0.21	0.48	0.58	1.16		25.0	64730
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*1.00*	*23.6*	
11.80	1.90	13.70				0.56	0.68		0.86	24.4	63944
11.00	*4.00*	*15.00*				*0.41*	*0.50*		*0.50*	*22.1*	
9.55	1.00	10.55				0.60	0.73	0.99		21.3	64412
8.00	*4.00*	*12.00*				*0.41*	*0.50*		*1.00*	*19.1*	
13.30	1.70	15.00	0.65		0.43	1.08	1.31		1.42	31.4	63946
12.00	*4.00*	*16.00*				*0.82*	*1.00*		*1.00*	*27.5*	
12.20	1.80	14.00	0.61		0.47	1.08	1.31	0.82	3.11	37.3	63947
11.00	*4.00*	*15.00*				*0.82*	*1.00*		*3.00*	*32.0*	
11.35	0.90	12.25		0.55	0.66	1.21	1.47	4.04		36.8	64413
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*4.00*	*33.0*	
11.20	1.20	12.40		0.72	0.99	1.71	2.08	2.27		34.4	64821
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*2.00*	*32.5*	
10.45	0.90	11.35		0.88	0.74	1.62	1.97	4.15		38.2	64414
11.00	0.70	11.70		0.95	0.91	1.86	2.26	4.15		40.4	64803
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*38.5*	
9.15	0.70	9.85		0.84	0.81	1.65	2.00	2.11		30.2	64415
9.65	7.80	17.45		0.20	1.43	1.63	1.98	2.17		33.9	64416
8.70	0.60	9.30	1.14		0.45	1.59	1.93	2.63		30.7	64804
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
9.85	1.45	11.30	1.22		0.55	1.77	2.15	2.14		32.4	64417
8.70	0.90	9.60		0.67	0.97	1.64	1.99	2.15		29.7	64418
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*29.5*	
10.30	2.40	12.70	2.14		0.78	2.92	3.54	1.02	2.94	45.8	63953
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*3.00*	*37.4*	
11.90	1.60	13.50	1.38		0.79	2.17	2.63	0.46	0.99	35.9	63954
9.00	*4.00*	*13.00*				*1.65*	*2.00*		*1.00*	*28.0*	
11.80	1.40	13.20	0.67		0.51	1.18	1.43	0.78	1.86	33.3	63955
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*2.00*	*27.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Price Chemical Co.	
64419	One-Ten-One Fertilizer	J. C. Bertram, Hidalgo ....
	Rasin-Monumental Co., (Sub. of Va-Car. Chem. Co., Inc.,) Cincinnati, O.	
63914	Rasin's Farmers Success	Manufacturer ....
63915	Rasin's Reliable Wheat and Corn Fertilizer	Manufacturer ....
63916	Rasin's Big Giant Phosphate	Manufacturer ....
64737	Rasin's General Favorite	J. H. Wyan, London ....
63918	Rasin's Sweepstakes Fertilizer	Manufacturer ....
63919	Rasin's Potato and Truck	Manufacturer ....
64429	Rasin's Big Burley Grower (Potash from Sulphate)	Lessenbery & Jones, Glasgow ....
	Read Phosphate Co., Nashville, Tenn.	
64436	Corn, Wheat, and Oat Grower	C. T. Calhoun, Montpelier ....
64742		J. H. Jasper, Somerset ....
64743		U. G. Antle, Columbia ....
64437	Kentucky Tobacco Grower	J. W. Bratcher, Berea ....
64438		Hollingsworth-Young Hdw. Co., Bowling Green ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
12.65	1.50	14.15	0.61		0.37	0.98	1.19		1.07	28.7	64419
10.00	*4.00*	*14.00*				*0.82*	*1.00*		*1.00*	*24.5*	
10.10	2.40	12.50				1.04	1.26	1.25		26.1	63914
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*1.00*		*20.5*	
10.00	1.70	11.70				1.04	1.26	1.16	1.39	29.6	63915
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*2.00*		*23.5*	
10.30	0.70	11.00		0.89	0.27	1.16	1.41	1.66	1.73	32.9	63916
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*3.00*		*26.5*	
9.20	1.20	10.40	0.47	0.81	0.38	1.66	2.02	2.37		31.4	64737
8.00	*1.50*	*9.50*				*1.65*	*2.00*	*2.00*		*28.5*	
13.90	0.90	14.80		1.52	0.28	1.80	2.19	0.82	1.37	38.6	63918
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*2.00*		*34.5*	
11.50	0.60	12.10	2.00			2.00	2.43	4.21		42.1	63919
10.00	*1.50*	*11.50*				*2.47*	*3.00*	*4.00*		*42.4*	
9.70	1.30	11.00				0.78	0.95	0.92	1.45	26.9	64429
8.00	*1.50*	*9.50*				*0.82*	*1.00*		*2.00*	*23.5*	
7.50	9.00	16.50	0.25		0.74	0.99	1.20	1.10		24.1	64436
8.20	6.90	15.10	0.25		0.61	0.86	1.04	0.84	0.42	24.0	64742
8.60	6.90	15.50	0.20		0.69	0.89	1.08	1.01		24.0	64743
7.00	*10.00*	*17.00*				*0.82*	*1.00*	*1.00*		*22.4*	
8.20	6.00	14.20				0.82	1.00	1.20		23.2	64437
10.20	4.10	14.30	0.54		0.32	0.86	1.04	1.70	1.38	29.5	64438
8.00	*5.00*	*13.00*				*0.82*	*1.00*		*1.00*	*21.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Read Phosphate Co.	
64439	Standard Tobacco Grower	Hollingsworth-Young Hdw. Co., Bowling Green ....
63257	Blood and Bone No. 1	Manufacturer ....
64440	Kentucky Special	Hatcher & Rawls, Cerulean ....
64441		Cowherd & Durham, Greensburg ....
64744		U. G. Antle, Columbia ....
64442	High Grade Tobacco Grower	Hollingsworth-Young Hdw. Co., Bowling Green ....
64443		John L. Hart, Cynthiana ....
63260	Blood and Bone Special	Manufacturer ....
63261	H. Gr. Ammoniated Dissolved Bone	Manufacturer ....
63262	Corn and Wheat Grower	Manufacturer ....
64444	Wheat and Clover Grower	Hatcher & Rawls, Cerulean ....
	The Smith Agricultural Chemical Co., Columbus, O.	
64028	Smith's Tobacco Grower 1-8-2	Manufacturer ....
64029	Smith's Tobacco Grower 1-8-4	Manufacturer ....
64030	Smith's Potato and Tobacco Special	Manufacturer ....
	Southern Fertilizer Co., Inc., Louisville, Ky.	
63749	Elk Corn and Wheat Grower	

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN					POTASH			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number
9.90	1.70	11.60		0.20	1.20	1.40	1.70	1.93		29.7	64439
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*2.00*	*29.9*	
10.60	6.10	16.70				2.23	2.71	2.23		37.4	63257
8.00	*5.00*	*13.00*				*1.65*	*2.00*	*2.00*		*29.9*	
7.50	2.80	10.30				0.81	0.98	2.97		26.1	64440
9.85	3.90	13.75				0.38	0.46	4.67		32.6	64441
9.40	6.60	16.00				0.49	0.59	3.38	0.91	32.6	64744
8.00	*5.00*	*13.00*				*0.41*	*0.50*	*4.00*		*28.5*	
8.00	3.80	11.80		0.55	1.12	1.67	2.03	3.86		35.1	64442
8.45	1.35	9.80		0.27	1.55	2.02	2.45	1.54	2.72	38.1	64443
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*4.00*	*35.9*	
13.10	4.30	17.40				1.45	1.76	1.44		34.4	63260
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*1.00*		*24.9*	
11.75	2.60	14.35				2.14	2.60	2.87		40.1	63261
10.00	*5.00*	*15.00*				*1.65*	*2.00*	*2.00*		*32.9*	
13.90	3.50	17.40				0.82	1.00	1.50		33.2	63262
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*24.0*	
11.20	2.70	13.90		0.32	0.94	1.26	1.53	1.94		31.4	64444
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*2.00*		*30.1*	
9.60	0.70	10.30		0.58	0.24	0.82	1.00	2.31		26.5	64028
8.00						*0.82*	*1.00*	*2.00*		*22.9*	
8.90	0.90	9.80		0.35	0.51	0.86	1.04	3.96		30.8	64029
8.00						*0.82*	*1.00*	*4.00*		*28.9*	
13.30	1.00	14.30		1.04	0.58	1.62	1.97	2.09		36.3	64030
12.00						*1.65*	*2.00*	*2.00*		*33.9*	
7.00	*1.00*	*8.00*				*0.82*	*1.00*		*1.00*	*18.8*	63749

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Southern Fertilizer Co.	
64447	Elk General Crop Grower	Corbin Supply Co., Corbin ....
63751	Elk Standard Guano	
64448	Elk Potash Special	Ratliff Hardware Co., Princeton ....
64449	Elk Tobacco Grower	Bush Coal Co., Winchester ....
64580		Chas. Griffith and Co., Carrollton ....
64451	Elk Wheat, Corn and Tobacco Special	Conrad-Payne and Co., Cloverport ...
	Southern Fertilizer & Chemical Co., Savannah, Ga.	
63747	Southern Fertilizer 2-12-2	Manufacturer ....
	Swift & Co., National Stock Yards, Ill.	
64452	Swift's Diamond "B" Fertilizer	W. E. Burress, Greensburg ....
64453		Jno. B. Marriott, Cecilia ....
64454	Swift's Diamond "A" Fertilizer	J. F. Collings, Shepherdsville ....
64455		John B. Marriott, Cecilia ....
64456	Swift's Grain and Tobacco Grower	Green & Duff, Mt. Sterling ....
64457		Vine Grove Feed Co., Vine Grove ....
64458	Swift's Champion Wheat and Corn Grower	Green & Duff, Mt. Sterling ....
64745		John B. Marriott, Cecilia ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
10.15	0.70	10.85	0.23		0.29	0.52	0.63	1.24		22.4	64447
10.00	*1.00*	*11.00*				*0.41*	*0.50*		*1.00*	*20.9*	
											63751
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*1.00*	*25.3*	
9.20	0.50	9.70		0.38	0.49	0.87	1.06	4.80		33.6	64448
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*29.3*	
10.50	0.80	11.30	0.85	0.42	0.63	1.90	2.31	2.10		33.8	64449
8.45	0.90	9.35	0.86	0.56	0.29	1.71	2.08	1.33		27.3	64580
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*1.00*	*25.3*	
8.30	0.40	8.70	0.88		0.62	1.50	1.82	2.20		28.2	64451
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*28.3*	
12.00	0.90	12.90		1.01	0.72	1.73	2.10	2.42		36.0	63747
12.00	*0.50*	*12.50*				*1.65*	*2.00*	*2.00*		*34.1*	
7.95	4.20	12.15	1.19	0.86	0.40	2.45	2.97	5.28		44.2	64452
11.15	2.75	13.90	1.14	0.74	0.40	2.28	2.77	3.20		40.9	64453
8.00	*3.00*	*11.00*				*2.47*	*3.00*	*5.00*		*43.0*	
8.30	3.80	12.10	0.92	0.90	0.31	2.13	2.59	2.56		34.4	64454
9.50	4.10	13.60	0.61	0.81	1.08	2.50	3.04	3.73		42.1	64455
8.00	*3.00*	*11.00*				*2.47*	*3.00*	*3.00*		*37.0*	
10.60	3.30	13.90	0.21	0.90	0.58	1.69	2.05	3.15		36.8	64456
10.95	1.45	12.40		0.81	0.86	1.67	2.03	3.32		37.0	64457
10.00	*3.00*	*13.00*				*1.65*	*2.00*	*4.00*		*38.1*	
12.40	3.10	15.50		0.94	0.92	1.86	2.26	1.98		36.9	64458
13.60	2.50	16.10		0.88	1.06	1.94	2.36	1.97		39.0	64745
12.00	*3.00*	*15.00*				*1.65*	*2.00*	*2.00*		*35.1*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Swift & Co.	
64746	Swift's Special Grain Grower	Finley Hardware Co., Madisonville ..
64459	Swift's Diamond “K” Grain Grower	John B. Marriott, Cecilia ....
64460		Farmer's Union Supply Co., Somerset
64747		John B. Marriott, Cecilia ....
64748		D. C. Hopper, Font Hill ....
64461	Swift's Diamond “W” Vegetable and Tobacco Grower	Staggs Brothers & Co., Vanceburg ....
64462		Vine Grove Feed Co., Vine Grove ..
64463	Swift's Superphosphate	Sam Terry, Big Clifty ....
64464		G. H. Harris, Cloverport ....
64465	Swift's Complete Fertilizer	F. M. Mitchell, Scottsville ....
64466		Farmer's Union Supply Co., Somerset.
64749		H. C. McClure, Somerset ....
64467	Swift's Diamond “W” Tobacco Gr	Mayhew & Gilbert, Franklin ....
64468		J. F. Collings, Shepherdsville ....
64750		E. M. Ford & Sons, Cave City ....
64535	Swift's Red Steer 3-12-3 Fertilizer	Manufacturer ....
64755	Swift's Red Steer 2-16-2 Fertilizer	D. C. Hopper, Font Hill ....
64538	Swift's Bone Meal and Potash	Manufacturer ....
	Taylor and Powell Fertilizer Co., Inc., Springfield, Tenn.	
64056	No. 6 Tobacco Grower	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
8.90	1.80	11.00		0.35	0.77	1.12	1.36	1.76		26.1	64746
10.00	*3.00*	*13.00*				*1.65*	*2.00*	*2.00*		*32.1*	
11.75	2.45	14.20		1.42		1.42	1.72	1.21		30.8	64459
12.40	1.80	14.20		0.37	0.61	0.98	1.19	1.89		30.9	64460
12.90	3.20	16.10		0.28	0.64	0.92	1.12	1.01		29.2	64747
13.30	2.60	15.90		0.42	0.68	1.10	1.34	1.15		31.0	64748
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*1.00*		*27.1*	
9.05	3.10	12.15		0.39	0.92	1.31	1.59	2.74		30.9	64461
8.90	1.90	10.80	0.64	0.48	0.38	1.50	1.82	2.71		31.2	64462
8.00	*3.00*	*11.00*				*1.65*	*2.00*	*3.00*		*32.1*	
8.50	2.30	10.80	0.81	0.45	0.33	1.59	1.93	1.52		27.8	64463
10.10	3.60	13.70		0.55	1.18	1.73	2.10	1.47		31.4	64464
8.00	*3.00*	*11.00*				*1.65*	*2.00*	*2.00*		*29.1*	
12.10	2.75	14.85	0.28	0.60	0.37	1.25	1.52	1.13		30.1	64465
9.20	2.40	11.60		0.25	0.44	0.69	0.84	1.64		23.8	64466
7.70	3.00	10.70		0.31	0.55	0.86	1.04	0.65		19.9	64749
8.00	*3.00*	*11.00*				*0.82*	*1.00*	*1.00*		*21.1*	
8.10	2.90	11.00	0.43	0.84	0.33	1.60	1.94	1.01		25.9	64467
8.55	3.15	11.70		0.95	0.68	1.63	1.98	0.99		26.8	64468
8.90	1.70	10.60		0.51	1.14	1.65	2.00	1.19		27.5	64750
8.00	*3.00*	*11.00*				*1.65*	*2.00*	*1.00*		*26.1*	
12.80	1.15	13.95	1.83	0.65		2.48	3.01	3.08	0.42	45.0	64535
12.00	*1.00*	*13.00*				*2.47*	*3.00*	*3.00*		*42.2*	
17.10	0.90	18.00		1.34		1.34	1.63	2.23		40.7	64755
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
15.20	3.70	18.90				0.90	1.09	4.89		44.4	64538
13.00	*5.00*	*18.00*				*0.82*	*1.00*		*4.00*	*38.4*	
9.85	1.55	11.40	2.40	0.41	0.59	3.40	4.13	3.95		47.7	64056
10.00						*1.65*	*2.00*		*4.00*	*36.9*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Tennessee Chemical Co., (Armoui Owned) Louisville, Ky., Cincinnati, O., Nashville, Tenn.	
64478	Ox Louisville Standard	Pineville Produce Co., Pineville ....
63535	Ox Crop Grower	Manufacturer ....
64757	Ox Wheat, Corn and Oats	N. B. Kelsay, Columbia ....
64479	Ox Slaughter House Bone	W. F. Grainger, Franklin ....
63540	Ox Beef, Blood and Bone	Manufacturer ....
64480	Ox High Grade Potato Grower	W. F. Grainger, Franklin ....
64481	Ox Truck Grower	McClure & Simms, Springfield ....
63544	Ox Kentucky's Choice	Manufacturer ....
64483 64484	Ox Louisville Tobacco Grower	Shaw & Reynolds, Cave City .... J. D. Wilson & Bro., Paris ....
63550	Ox Tobacco and Potato Grower	Manufacturer ....
64485	Ox Special Tobacco Grower	J. S. Duke, Crab Orchard ....
63552	Ox Special Corn and Tobacco Maker	Manufacturer ....
64486 64487	Ox Big Tobacco Maker	Sexton Bros., Murray .... P. A. Blackwell & Co., Henderson ....
63554	Ox Burley Tobacco Grower	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
9.15	0.50	9.65	0.21	0.34	0.41	0.96	1.17	1.32		23.7	64478
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*20.3*	
9.80	3.30	13.10		0.48	0.56	1.04	1.26	1.12		25.6	63535
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*1.00*		*23.3*	
12.60	0.80	13.40	0.61		0.24	0.85	1.03	1.28		28.2	64757
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	
8.35	2.85	11.20	0.45	0.46	0.43	1.34	1.63	2.15		28.2	64479
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*28.3*	
11.50	1.30	12.80	0.96	0.25	0.37	1.58	1.92	2.06		33.4	63540
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*34.3*	
10.05	3.25	13.30		1.04	0.75	1.79	2.17	3.52		37.7	64480
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	
7.60	2.00	9.60	0.73	0.94	1.60	3.27	3.98	4.15		44.3	64481
8.00	*1.00*	*9.00*				*3.29*	*4.00*	*3.00*		*41.1*	
12.10	1.30	13.40	0.24	0.56	0.91	1.71	2.08	6.48		48.4	63544
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*6.00*		*46.3*	
10.45	3.15	13.60		0.52	0.31	0.83	1.01	1.64		26.8	64483
10.95	0.75	11.70		0.21	0.59	0.80	0.97	1.14	0.39	26.2	64484
10.00	*1.00*	*11.00*				*0.82*	*1.00*		*2.00*	*26.3*	
8.80	2.50	11.30	0.79	0.34	0.44	1.57	1.91	1.13		27.0	63550
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*1.00*		*25.3*	
8.45	0.55	9.00	0.63		0.41	1.04	1.26	1.11		22.5	64485
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*20.3*	
11.80	2.70	14.50		0.48	0.51	0.99	1.20	1.15		28.2	63552
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*26.3*	
8.95	5.60	14.55		0.98	0.72	1.70	2.06	1.60	1.99	36.6	64486
8.10	2.75	10.85		0.84	0.70	1.54	1.87	2.02	1.94	34.4	64487
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*34.3*	
8.50	2.70	11.20	0.57	1.25	0.68	2.50	3.04	2.10	3.74	46.4	63554
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*45.2*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Tennessee Chemical Co.	
64488	Ox Plant Bed Special	McClure & Simms, Springfield ....
63564	Ox Double Standard	Manufacturer ....
64493 64494	Ox Special Tobacco Guano	W. F. Grainger, Franklin .... T. J. Turley Co., Owensboro.........
64061	Ox Tobacco Grower	
64544	Ox Wheat Special	
	Victor Guano Co., Nashville, Tenn.	
64497	Standard Tobacco Grower	Lambert, Gresham Hdw. Co., Henderson ....
63283	Kentucky Home Guano	Manufacturer ....
63284	Kentucky Soil Food	Manufacturer ....
63285	Corn and Wheat Grower	Manufacturer ....
63286	High Grade Grain Guano	Manufacturer ....
63287	Wheat, Oats, and Corn Guano	Manufacturer ....
63288	Complete Grain Guano	Manufacturer ....
63289	High Grade Tobacco Guano	Manufacturer ....
	Virginia-Carolina Chem. Co., Inc., Cincinnati, Ohio.	
63889	V.-C. Complete Manure	Manufacturer ....

Complete Fertilizers.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
12.90	1.00	13.90	0.91	0.77	0.73	2.41	2.93	1.06	1.09	40.7	64488
12.00	*1.00*	*13.00*				*2.47*	*3.00*		*2.00*	*39.2*	
16.10	0.90	17.00		1.00	0.67	1.67	2.03	2.53		42.1	63564
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*40.3*	
10.10	2.60	12.70	0.87	0.44	0.63	1.94	2.36	1.97		33.7	64493
10.05	2.60	12.65	0.43	0.46	0.52	1.41	1.71	2.74		32.8	64494
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*2.00*	*31.3*	
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*10.00*	*52.3*	64061
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*37.3*	64544
11.85	2.60	14.45	0.42		0.81	1.23	1.49	1.78		31.6	64497
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*2.00*	*29.9*	
10.00	7.60	17.60				1.58	1.92	0.60	0.34	30.3	63283
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*1.00*		*21.9*	
11.00	3.00	14.00				0.87	1.06	4.13		35.3	63284
8.00	*5.00*	*13.00*				*0.41*	0.50	*4.00*		*28.5*	
13.10	4.30	17.40				1.45	1.76	1.44		34.4	63285
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*1.00*		*24.9*	
11.75	2.60	14.35				2.14	2.60	2.87		40.1	63286
10.00	*5.00*	*15.00*				*1.65*	*2.00*	*2.00*		*32.9*	
13.90	3.50	17.40				0.82	1.00	1.50		33.2	63287
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*24.0*	
14.35	1.40	15.75				1.44	1.75	2.37		37.8	63288
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*2.00*		*30.1*	
8.70	7.30	16.00				2.31	2.80	0.72	3.44	42.3	63289
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*4.00*	*35.9*	
10.10	2.40	12.50				1.04	1.26	1.25		26.1	63889
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*1.00*		*20.5*	

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Virginia-Carolina Chemical Co.	
64581	V.-C. Champion Corn and Wheat Gr.	Franks & Fry, Walton ....
64505	V.-C. Farmer's Friend	Taylor County Supply Co., Campbellsville ....
64770		Taylor County Supply Co., Campbellsville ....
64506	V.-C. Beef, Blood, and Bone B B B	Jack Hysinger, Mt. Vernon ....
64507		Patrick Dillon, Hardinsburg ....
64771		Patrick Dillon, Hardinsburg ....
64772		Taylor County Supply Co., Campbellsville ....
64508	V.-C. Springfall Fertilizer	Aaron Moore, Leitchfield ....
64509		Wayne County Farm Bureau, Monticello ....
63894	V.-C. Big Potato and Truck	Manufacturer ....
64510	V.-C. Bright Tobacco Fertilizer (Potash from Sulphate)	Stewart & Co., Munfordville ....
64511	V.-C. Gem Fertilizer for Tobacco	Stewart & Co., Munfordville ....
64512		Jack Hysinger, Mt. Vernon ....
63899	V.-C. Plant Food for Vegetables, Lawns, and Flowers	Manufacturer ....
64558	V.-C. Progressive Farmer	

Complete Fertilizers.

Phosphoric Acid			Nitrogen					Potash			
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	From Muriate	From Sulfate	Index of Relative Value	Station Number.
9.45	1.60	11.05	0.21	1.61	0.28	2.10	2.55	2.21		34.1	64581
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*2.00*		*23.5*	
9.20	1.75	10.95				0.90	1.09	2.88		28.5	64505
9.20	8.70	17.90	0.63		0.28	0.91	1.10	2.89		31.4	64770
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*3.00*		*26.5*	
9.05	1.60	10.65		1.28	0.50	1.78	2.16	2.11		30.7	64506
8.10	1.20	9.30		1.04	0.44	1.48	1.80	2.21		28.1	64507
9.50	9.10	18.60		1.32	0.39	1.71	2.08	2.19		34.7	64771
10.00	7.90	17.90	0.30	0.95	0.29	1.54	1.87	1.83		32.9	64772
8.00	*1.50*	*9.50*				*1.65*	*2.00*	*2.00*		*28.5*	
12.55	1.40	13.95		0.56	1.08	1.64	1.99	2.00		35.2	64508
13.25	1.85	15.10		1.35	0.43	1.78	2.16	2.19		37.9	64509
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*2.00*		*34.5*	
10.50	1.00	11.50	2.28			2.28	2.77	4.40		43.0	63894
10.00	*1.50*	*11.50*				*2.47*	*3.00*	*4.00*		*42.4*	
9.55	0.90	10.45	0.69		0.35	1.04	1.26	0.78	1.26	27.1	64510
8.00	*1.50*	*9.50*				*0.82*	*1.00*		*2.00*	*23.5*	
10.00	1.30	11.30				1.72	2.09	0.66	0.45	29.2	64511
9.95	1.15	11.10	0.61		1.23	1.84	2.23	0.90	0.49	30.6	64512
9.00	*1.50*	*10.50*				*1.65*	*2.00*		*1.00*	*27.0*	
9.80	2.70	12.50	0.68	4.48	0.53	5.69	6.91	3.33		59.9	63899
8.00	*1.50*	*9.50*				*4.92*	*6.00*	*3.00*		*51.1*	
16.00	*2.00*	*18.00*				*1.65*	*2.00*	*2.00*		*40.7*	64558

TABLE I.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Wood, Stubbs & Co., Inc., Louisville, Ky.	
63999	Acme Potato and Tobacco Grower	Manufacturer ....
64000	Acme Special Potato Grower	Manufacturer ....
64001	Acme Wheat and Corn Grower	Manufacturer ....
64004	Acme Three-Eight-Five	Manufacturer ....

COMPLETE FERTILIZERS.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total		From Muriate	From Sulfate		
9.60	2.10	11.70				1.07	1.30	0.76	1.11	27.3	63999
8.00	*4.00*	*12.00*				*0.82*	*1.00*		*2.00*	*24.5*	
9.30	3.00	12.30	1.21		0.81	2.02	2.45	1.44	2.22	38.3	64000
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*32.5*	
12.40	2.30	14.70				0.62	0.75	0.72	0.86	28.0	64001
10.00	*4.00*	*14.00*				*0.41*	*0.50*		*1.00*	*22.1*	
8.85	2.60	11.45	2.09		1.00	3.09	3.75	1.06	5.20	51.6	64004
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*5.00*	*43.4*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agr'l Chem. Co., Inc., Cincinnati, O.	
64096	A. A. C. Ground Bone	L. B. Sievers & Son, Somerset
64097		Hill Hardware Co., Bowling Green
64585		Hill Hardware Co., Bowling Green
64586		Woodson Lewis, Greensburg
	Armour Fertilizer Works, Louisville, Ky., Cincinnati, O., Nashville, Tenn.	
64172	Armour's Big Crop Bone Meal	Lebanon Carriage & Impl. Co., Lebanon
64173		Barren Co. Grocery & Hdw. Co., Glasgow
64626		Lebanon Carriage & Impl. Co., Lebanon
64783		Wilson, Winn & Co., Russellville
64174	Armour's Big Crop Raw Bone	Ed. Allen & Co., Smith's Grove
64175		Moss & Gibson, Crestwood
64784		The T. J. Turley Co., Owensboro
63522	Armour's Big Crop Kentucky Bone Meal	Manufacturer
64521	Bone Meal	
64786	Bone Meal	Jenkins-Essex Co., Elizabethtown
	Buhner Fertilizer Co., Seymour, Ind.	
64517	Buhner's Raw Bone	Manufacturer
	Calumet Fertilizer Co., New Albany, Ind.	
64194	Calumet Br. Spl. Pure Bone Meal	Pearson & Breedlove, Franklin
64635		I. K. Miller & Sons, Campbellsville
64636		A. W. Tarter, Columbia

Bones, Tankage, &c.

Percentage of Fineness		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	Potash		Index of Relative Value	Station Number.
Fine Bone	Medium Bone					From Muriate	From Sulfate		
83	17	31.10	67.92	1.71	2.08			35.1	64096
87	13	28.50	62.25	1.67	2.03			32.8	64097
75	25	29.40	64.21	1.97	2.39			35.3	64585
70	30	30.95	67.62	1.60	1.94			34.4	64586
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
83	17	26.00	56.77	3.02	3.67			38.9	64172
77	23	27.00	58.96	2.55	3.10			36.9	64173
79	21	28.15	61.48	2.50	3.04			37.5	64626
66	34	27.30	59.62	3.00	3.64			39.8	64783
		24.00	*52.42*	*2.47*	*3.00*			*34.0*	
100		23.80	51.96	3.59	4.36			40.6	64174
64	36	24.00	52.42	3.60	4.37			40.8	64175
100		25.00	54.59	2.85	3.46			37.1	64784
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
76	24	26.25	57.33	2.26	2.74			34.6	63522
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
									64521
		30.00	*65.52*	*1.85*	*2.25*			*35.1*	
78	22	26.70	58.31	2.99	3.63			39.3	64786
		27.00	*58.96*	*2.47*	*3.00*			*36.4*	
56	44	21.50	46.95	4.20	5.10			42.4	64517
		20.00	*43.67*	*3.71*	*4.50*			*38.3*	
76	24	34.70	75.77	0.72	0.87			32.1	64194
69	31	34.80	76.00	0.62	0.75			31.6	64635
69	31	34.80	76.00	0.66	0.80			31.8	64636
		30.00	*65.52*	*0.82*	*1.00*			*28.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Calumet Fertilizer Co.	
63771	Calumet Br. Raw Bone Meal	
	The Cincinnati Phosphate Co., (owned and operated by Armour Fertilizer Works) Cincinnati, O.	
63615	Bone Meal	
63616	Raw Bone	Manufacturer ....
64547	Bone Meal	
64548	Bone Meal	
	Consolidated Chem. Co., Louisville, Ky.	
63992	Camel Brand Raw Bone	Manufacturer ....
63993	Camel Brand Steamed Bone	Manufacturer ....
	Duncan & Sherley, LaGrange, Ky.	
64574	Tiger Brand Raw Bone Meal	Manufacturer's warehouse ....
	The Empire Guano Co., Nashville, Tenn.	
63280	Bone Mixture	Manufacturer ....
63281	Raw Bone Meal	Manufacturer ....
	The Evansville Packing Co., Evansville, Ind.	
63461	Bone Meal	Manufacturer ....

Bones, Tankage, &c.

PERCENTAGE OF FINENESS		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Fine Bone	Medium Bone					From Muriate	From Sulfate		
		20.00	*43.67*	*3.71*	*4.50*			*38.3*	63771
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	63615
100		23.60	51.55	4.05	4.92			43.2	63[illegible]
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
		30.00	*65.52*	*1.85*	*2.25*			*35.1*	[illegible]
		27.00	*58.96*	*2.47*	*3.00*			*36.4*	64548
59	41	20.80	45.43	4.70	5.71			44.8	63992
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
78	22	30.40	66.39	0.74	0.90			28.8	63993
		30.00	*65.52*	*1.03*	*1.25*			*30.2*	
45	55	22.55	49.26	4.05	4.92			42.3	64574
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
56	44	19.30	42.16	1.86	2.26			26.6	63280
		20.00	*43.67*	*1.23*	*1.50*			*23.4*	
40	60	20.85	45.54	5.06	6.14			47.0	63281
		20.00	*43.67*	*3.71*	*4.50*			*38.3*	
72	28	36.20	79.07	0.58	0.70			32.4	63461
		29.00	*63.34*	*0.82*	*1.00*			*28.1*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Evansville Packing Co.	
64225	Pure Raw Bone Meal	C. B. Carden and Co., Hartford......
	Federal Chemical Co., Inc., Louisville, Ky.	
64794	Daybreak Raw Bone	St. Matthews Produce Exchange, St. Matthews ....
64253 64652	Pure Bone	J. S. Whitfill, Leitchfield............ Planters Hdw. Co., Hopkinsville.....
63743	1st Prize Raw Bone	Manufacturer ....
	Fox Chemical Co., Br. Federal Chemical Co., Inc. Louisville, Ky.	
63800	Fox Raw Bone	Manufacturer ....
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
63831	Globe Raw Bone	Manufacturer ....
	Groves Fertilizer Works, Cincinnati, Ohio.	
64023	Bone Meal	Manufacturer ....
64313	Raw Bone	S. V. Kissee, Ingle ....
	Hall Seed Co., Louisville, Ky.	
63573	Halco Bone Meal	Manufacturer ....
63574	Halco Raw Bone	Manufacturer ....

BONES, TANKAGE, &c.

PERCENTAGE OF FINENESS		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Fine Bone	Medium Bone					From Muriate	From Sulfate		
52	48	25.20	55.04	3.45	4.19			40.9	64225
		23.00	*50.24*	*3.71*	*4.50*			*40.7*	
74	26	22.40	48.92	3.90	4.73			41.3	64794
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
74	26	34.50	75.36	0.78	0.95			32.3	64253
72	28	34.50	75.35	0.86	1.04			32.8	64652
		30.00	*65.52*	*1.03*	*1.25*			*30.2*	
50	50	23.65	51.66	4.38	5.32			45.2	63743
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
50	50	23.65	51.66	4.38	5.32			45.2	63800
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
50	50	23.65	51.66	4.38	5.32			45.2	63831
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
84	16	29.30	63.98	1.58	1.92			32.9	64023
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
59	41	24.35	53.17	4.11	4.99			44.1	64313
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
76	24	26.25	57.33	2.26	2.74			34.6	63573
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
79	21	23.70	51.73	3.99	4.84			42.9	63574
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Hopkins Fertilizer Co., New Albany, Ind.	
64685	Pure Raw Bone	J. J. Eskridge, Leitchfield..........
64798		Duncan and Sherley, LaGrange......
63875	Pure Steamed Bone	Manufacturer ....
64687	Bone Meal and Phosphate	J. J. Eskridge, Leitchfield..........
64688	Pig Knuckle Bone Meal	J. J. Eskridge, Leitchfield..........
	International Agri. Corp., Inc., Cincinnati, O.	
63427	I. A. C. Bone Mixture	Manufacturer ....
64336	I. A. C. Bone Meal	W. E. Ellis and Bro., Hartford.......
64346	Buffalo Special Bone and Phosphate	W. B. Davis, Princeton.............
	The Jarecki Chem. Co. (Armour owned), Cincinnati, O.	
63590	Bone Meal	
63591	Raw Bone	Manufacturer ....
64539	Bone Meal	
64546	Bone Meal	
	The Kaufman Fert. Co. (Owned and operated by Armour Fert. Works), Cincinnati, O.	
63638	Bone Meal	
63639	Raw Bone	Manufacturer ....

BONES, TANKAGE, &C.

PERCENTAGE OF FINENESS		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Fine Bone	Medium Bone					From Muriate	From Sulfate		
53	47	20.90	45.65	3.82	4.64			39.6	64685
64	36	22.00	48.06	4.17	5.06			42.6	64798
		21.50	*46.95*	*3.51*	*4.25*			*38.3*	
73	27	31.50	68.79	0.74	0.90			29.6	63875
		29.00	*63.34*	*0.82*	*1.00*			*28.1*	
80	20	20.50	44.77	1.13	1.37			23.2	64687
		21.00	*45.87*	*1.03*	*1.25*			*23.0*	
75	25	23.40	51.10	1.90	2.31			30.1	64688
		22.00	*48.06*	*2.00*	*2.43*			*29.6*	
83	17	23.50	51.33	0.95	1.15			24.5	63427
		22.00	*48.06*	*0.82*	*1.00*			*22.5*	
74	26	29.60	64.65	1.56	1.89			33.0	64336
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
78	22	22.50	49.15	0.95	1.15			23.7	64346
		22.00	*48.06*	*0.82*	*1.00*			*22.5*	
									63590
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
100		23.60	51.55	4.05	4.92			43.2	63591
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
									64539
		27.00	*58.96*	*2.47*	*3.00*			*36.4*	
									64546
		30.00	*65.52*	*1.85*	*2.25*			*35.1*	
									63638
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
100		23.60	51.55	4.05	4.92			43.2	63639
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Kaufman Fertilizer	
64549	Bone Meal	
64550	Bone Meal	
	Ky. Fert. Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.	
63859	O. K. Raw Bone	Manufacturer ....
	Louisville Fertilizer Co. (Armour owned), Lou. Ky., Cin. O., Nash., Tenn.	
63488	Bone Meal	Manufacturer ....
64393	Raw Bone	D. E. Patterson, Hodgenville........
64397	Kentucky Bone Meal	Yopp Seed Co., Paducah............
64519	Bone Meal	
64720	Bone Meal	Hurst-Brown Hardware Co., Bardstown
64721		Yopp Seed Co., Paducah.............
	Morris and Co., Chicago, Ill.	
64819	Morris Big Seven	Farmers' Union Supply Co., Franklin
	Mt. Pleasant Fertilizer Co., Inc., Mt. Pleasant, Tenn.	
64725	Mt. Pleasant Half and Half	Farmers' Union Supply Co., Franklin

BONES, TANKAGE, &C.

PERCENTAGE OF FINENESS		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number.
Fine Bone	Medium Bone					From Muriate	From Sulfate		
									64549
		30.00	*65.52*	*1.85*	*2.25*			*35.1*	
									64556
		27.00	*58.96*	*2.47*	*3.00*			*36.4*	
50	50	23.65	51.66	4.38	5.32			45.2	63859
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
72	28	27.40	59.85	2.49	3.02			36.9	63488
		24.00	*52.42*	*2.47*	*3.00*			*34.0*	
									63489
29	71	24.85	54.27	4.00	4.86			43.9	64393
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
70	30	29.85	65.18	1.89	2.29			35.2	64397
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
									64519
		30.00	*65.52*	*1.85*	*2.25*			*35.1*	
32	68	25.20	55.04	4.01	4.87			44.2	64720
71	29	28.70	62.68	2.11	2.56			35.6	64721
		27.00	*58.96*	*2.47*	*3.00*			*36.4*	
71	29	20.40	44.56	1.00	1.21			22.3	64819
		22.00	*48.06*	*0.82*	*1.00*			*22.5*	
69	31	26.70	58.31	1.62	1.97			31.1	64725
		20.00	*43.67*	*1.65*	*2.00*			*25.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	New Louisville Rendering Co., Inc., Louisville, Ky.	
64041	Pure Animal Matter, Meat, Bones and Blood	
64042	Pure Bone Meal	
	Price Chemical Co., Inc., Louisville, Ky.	
63966	Raw Bone	Manufacturer ....
64424	Steamed Bone	John Keeton, Monticello............
	Read Phosphate Co., Nashville, Tenn.	
63265	Bone Mixture	Manufacturer ....
64445	Pure Raw Bone Meal	O. D. Smith, Jamestown.............
64446		Hollingsworth-Young Hdw. Co., Bowling Green ....
	Smith Brothers, New Albany, Ind.	
64552	Pure Raw Bone	
	Swift and Co., National Stock Yards, Ill.	
64475	Swifts' 2¼-29 Bone Meal Fertilizer	J. L. Townsend and Co., Clay........
64476		Clay Sutherland, Monticello..........
64754		Mayhew and Gilbert, Franklin.......
64477	Swifts' Raw Bone Meal Fertilizer	Mayhew and Gilbert, Franklin.......

Bones, Tankage, &c.

Percentage of Fineness		Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	Potash		Index of Relative Value	Station Number.
Fine Bone	Medium Bone					From Muriate	From Sulfate		
		10.00	*21.85*	*4.00*	*4.86*			*32.0*	64041
		22.00	*48.06*	*3.50*	*4.25*			*38.6*	64042
59	41	20.80	45.43	4.70	5.71			44.8	63966
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
71	29	30.45	66.50	0.78	0.95			29.0	64424
		30.00	*65.52*	*1.03*	*1.25*			*30.2*	
56	44	19.30	42.16	1.86	2.26			26.6	63265
		20.00	*43.67*	*1.23*	*1.50*			*23.4*	
31	69	23.00	50.24	3.77	4.58			41.0	64445
45	55	22.25	48.59	3.86	4.69			41.0	64446
		20.00	*43.67*	*3.71*	*4.50*			*38.3*	
		21.50	*46.95*	*3.50*	*4.25*			*38.2*	64552
80	20	29.95	65.41	1.73	2.10			34.3	64475
84	16	29.30	63.98	2.21	2.68			36.7	64476
82	18	30.80	67.28	1.79	2.17			35.4	64754
		29.00	*63.34*	*1.85*	*2.25*			*34.3*	
73	27	25.50	51.33	4.17	5.06			45.4	64477
		23.00	*50.24*	*3.71*	*4.50*			*40.7*	

TABLE II.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Taylor and Powell Fertilizer Co., Inc., Springfield, Tenn.	
64053	Half and Half	Manufacturer ....
64054	Pure Raw Bone Meal	Manufacturer ....
	Tennessee Chemical Co. (Armour owned), Lou., Ky., Cin., O., Nash., Tenn.	
64489	Ox Bone Meal	W. F. Grainger, Franklin...........
63558	Ox Raw Bone	
64492	Ox Kentucky Bone Meal	J. J. Shaver, Mayfield..............
64523	Bone Meal	
64524	Bone Meal	
	Virginia-Carolina Chemical Co., Inc., Cincinnati, O.	
64513 64514	V-C Raw Bone Meal	R. H. Chrisman, Berea.............. C. E. Preston, Smith's Grove........
64773	V-C Pure Bone Meal	Patrick Dillon, Hardinsburg........

BONES, TANKAGE, &C.

Percentage of Fineness: Fine Bone	Percentage of Fineness: Medium Bone	Total Phosphoric Acid.	Equivalent to Bone Phosphate	Nitrogen	Equivalent to Ammonia	Potash: From Muriate	Potash: From Sulfate	Index of Relative Value	Station Number.
86	14	21.80	47.61	1.77	2.15			28.1	64053
		20.00	*43.67*	*1.65*	*2.00*			*25.9*	
100		25.30	55.27	3.54	4.30			41.5	64054
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
78	22	27.40	59.85	2.57	3.12			37.3	64489
		24.00	*52.42*	*2.47*	*3.00*			*34.0*	
									63558
		22.00	*48.06*	*3.71*	*4.50*			*39.9*	
79	21	26.90	58.76	2.69	3.27			37.7	64492
		27.00	*58.96*	*1.65*	*2.00*			*31.5*	
									64523
		30.00	*65.52*	*1.85*	*2.25*			*35.1*	
									64524
		27.00	*58.96*	*2.47*	*3.00*			*36.4*	
65	35	20.95	45.77	3.65	4.43			38.7	64513
67	33	23.65	51.66	3.68	4.47			41.0	64514
		20.00	*43.67*	*3.71*	*4.50*			*38.3*	
100		25.50	55.68	3.30	4.01			40.2	64773
		22.00	*48.06*	*2.47*	*3.00*			*32.4*	

Table III.—Acid Phosphates.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Phosphoric Acid			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	A. D. Adair and McCarty Bros., Inc., Atlanta, Ga. and Chattanooga, Tenn.						
64088	Adair's High Grade Acid Phosphate No. 16	C. A. Castel, East Bernstadt......	18.10	1.10	19.20	21.7	64088
64089		W. C. Stewart, Horse Cave.......	18.55	0.45	19.00	22.3	64089
			16.00			*19.2*	
	The American Agri. Chem. Co., Inc., Cincinnati, O.						
63300	Bowker's 10% Acid Phosphate	Manufacturer	11.50	1.30	12.80	13.8	63300
			10.00	*2.00*	*12.00*	*12.0*	
63301	Bowker's Soluble Bone	Manufacturer	15.55	1.50	17.05	18.7	63301
			14.00	*2.00*	*16.00*	*16.8*	
64099	Bowker's 16% Acid Phosphate	Mayhew and Gilbert, Franklin....	18.55	1.40	19.95	22.3	64099
64100		L. B. Sievers and Son, Somerset...	16.95	1.60	18.55	20.3	64100
64587		Gooch and Payne, Eubank........	17.40	1.50	18.90	20.9	64587
64588		Mayhew and Gilbert, Franklin....	18.10	1.20	19.30	21.7	64588
			16.00	*2.00*	*18.00*	*19.2*	
63318	Bowker's 20% Acid Phosphate	Manufacturer	21.20	2.00	23.20	25.4	63318
			20.00	*2.00*	*22.00*	*24.0*	
63319	Bradley's 10% Acid Phosphate	Manufacturer	11.50	1.30	12.80	13.8	63319
			10.00	*2.00*	*12.00*	*12.0*	
63320	Bradley's Soluble Dissolved Bone	Manufacturer	15.55	1.50	17.05	18.7	63320
			14.00	*2.00*	*16.00*	*16.8*	
64113	Bradley's 16% Acid Phosphate	G. V. Green, Caneyville.........	18.60	1.05	19.65	22.3	64113
			16.00	*2.00*	*18.00*	*19.2*	

63335	Bradley's 20% Acid Phosphate	Manufacturer	21.20	2.00	23.20	25.4	63335
			20.00	*2.00*	*22.00*	*24.0*	
63336	Cleveland Dryer Works Horsehead Phosphate	Manufacturer	11.50	1.30	12.80	13.8	63336
			10.00	*2.00*	*12.00*	*12.0*	
64114	Cleveland Dryer Works XXX Super-Phosphate	Wesley and Jasper, Mangum	16.45	1.05	17.50	19.7	64114
			14.00	*2.00*	*16.00*	*16.8*	
64115	Cleveland Dryer Works 16% Acid Phosphate	Wesley and Jasper, Mangum	18.05	1.35	19.40	21.7	64115
64116		H. M. Tomes, Caneyville	18.20	1.00	19.20	21.8	64116
64597		H. M. Tomes, Caneyville	18.00	1.30	19.30	21.6	64597
			16.00	*2.00*	*18.00*	*19.2*	
63352	Cleveland Dryer Works 20% Acid Phosphate		21.20	2.00	23.20	25.4	63352
			20.00	*2.00*	*22.00*	*24.0*	
64117	Michigan Carbon Works 10% Acid Phosphate	Albert Long, Scottsville	12.90	0.85	13.75	15.5	64117
			10.00	*2.00*	*12.00*	*12.0*	
64118	Red Lime Phosphate	Albert Long, Scottsville	16.15	1.00	17.15	19.4	64118
64599		Albert Long, Scottsville	16.40	1.90	18.30	19.7	64599
			14.00	*2.00*	*16.00*	*16.8*	
64119	Michigan Carbon Works 16% Acid Phosphate	The Jansen Hardware Co., Covington	18.10	0.90	19.00	21.7	64119
64120		Denton Hardware Co., Madisonville	17.85	0.70	18.55	21.4	64120
64600		Scaggs and Nunn, Horse Cave	17.20	1.40	18.60	20.6	64600
64775		Greenup Milling Co., Grayson	18.40	1.40	19.80	22.1	64775
			16.00	*2.00*	*18.00*	*19.2*	
63371	Michigan Carbon Works 20% Acid Phosphate	Manufacturer	21.20	2.00	23.20	25.4	63371
			20.00	*2.00*	*22.00*	*24.0*	
64136	N. W. Horseshoe Br. Quick Acting Phosphate	Sam Terry, Big Clifty	11.95	1.00	12.95	14.3	64136
64609		Frank Baker, Clarkson	10.15	2.35	12.50	12.2	64609
			10.00	*2.00*	*12.00*	*12.0*	
64137	N. W. Horseshoe Br. Square Deal Phosphate	Sam Terry, Big Clifty	15.85	1.45	17.30	19.0	64137
64610		Woodson Lewis, Greensburg	15.10	1.50	16.60	18.1	64610
			14.00	*2.00*	*16.00*	*16.8*	

Table III.—Acid Phosphates.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Phosphoric Acid			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	The American Agri. Chem. Co.						
64138	N. W. Horseshoe Br. 16% Acid Phosphate	J. C. Phelps, Morgantown........	18.60	1.40	20.00	22.3	64138
64139		Woodson Lewis, Greensburg......	17.85	1.40	19.25	21.4	64139
64611		Woodson Lewis, Greensburg......	17.10	2.00	19.10	20.5	64611
64612		Dickey and Co., Glasgow.........	18.20	1.40	19.60	21.8	64612
			16.00	*2.00*	*18.00*	*19.2*	
63390	N. W. Horseshoe Br. 20% Acid Phosphate	Manufacturer	21.20	2.00	23.20	25.4	63390
			20.00	*2.00*	*22.00*	*24.0*	
63391	Packers Boars Hd. Br. Soluble Phosphate	Manufacturer	11.50	1.30	12.80	13.8	63391
			10.00	*2.00*	*12.00*	*12.0*	
63392	Packers Boars Hd. Br. Gilt Edge Phosphate	Manufacturer	15.55	1.50	17.05	18.7	63392
			14.00	*2.00*	*16.00*	*16.8*	
64149	Packers Boars Head Br. 16% Acid Phosphate	R. Z. Hook, Hardinsburg..........	18.55	1.15	19.70	22.3	64149
			16.00	*2.00*	*18.00*	*19.2*	
63409	Packers Boars Head Br. 20% Acid Phosphate	Manufacturer	21.20	2.00	23.20	25.4	63409
			20.00	*2.00*	*22.00*	*24.0*	
	Armour Fertilizer Works, Louisville, Ky., Cincinnati, Ohio and Nashville, Tennessee						
64176	Armour's Big Crop Sixteen Per Cent	Pearson and Breelove, Franklin...	16.30	2.20	18.50	19.6	64176
64177		M. T. Jasper and Son, Mintonville.	16.05	1.65	17.70	19.3	64177

64627		Frank Henry, Center	16.15	2.30	18.45	19.4	64627
64628		G. W. Collins, Glens Fork	16.15	1.40	17.55	19.4	64628
			16.00	*1.00*	*17.00*	*19.2*	
64178	Armour's Big Crop Twenty Per Cent	W. O. Cropper, Burtonville	20.85	0.95	21.80	25.0	64178
			20.00	*1.00*	*21.00*	*24.0*	
64181	Ideal Super Phosphate	T. J. Turley Co., Owensboro	13.70	2.20	15.90	16.4	64181
64785		T. J. Turley Co., Owensboro	18.30	2.10	20.40	22.0	64785
			16.00	*1.00*	*17.00*	*19.2*	
64059	Armour's Fourteen Per Cent						64059
			14.00	*1.00*	*15.00*	*16.8*	
	C. S. Brent Seed Co., Inc., Lexington, Ky.						
64569	Brent's Acid Phosphate	Manufacturer's warehouse	16.80	0.45	17.25	20.2	64569
			16.00			*19.2*	
	Calumet Fertilizer Co., New Albany, Ind.						
64192	Calumet Br. 16% Acid Phosphate	Frank Baker, Clarkson	18.25	0.30	18.55	21.9	64192
64193		Sturgis Impl. and Hdw. Co., Sturgis	17.40	0.45	17.85	20.9	64193
			16.00	*2.00*	*18.00*	*19.2*	
	The Cincinnati Phos. Co. (owned and operated by Armour Fertilizer Works), Cincinnati, O.						
64196	Acid Phosphate	G. W. Collins, Glensfork	17.69	1.15	18.84	21.2	64196
64638		L. R. Hart, Big Clifty	16.90	0.30	17.20	20.3	64638
			16.00	*1.00*	*17.00*	*19.2*	
63622	Acid Phosphate		20.75	1.75	22.50	24.9	63622
			20.00	*1.00*	*21.00*	*24.0*	
	Consolidated Chemical Co., Louisville, Ky.						
64209	Camel Brand H. Gr. Phosphate	J. R. Duncan, Monticello	18.25	2.40	20.65	21.9	64209
64640		E. S. Ferrell and Sons, Buffalo	17.00	0.90	17.90	20.4	64640
			16.00	*2.00*	*18.00*	*19.2*	

Taple III.—Acid Phosphates.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Phosphoric Acid			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	Consolidated Chemical Co.						
63991	Camel Brand Acid Phosphate	Manufacturer	22.40	0.70	23.10	26.9	63991
			14.00	*2.00*	*16.00*	*16.8*	
	Darling and Co., Chicago, Ill.						
64071	Darling's 16% Acid Phosphate						64071
			16.00			*19.2*	
	Duncan and Sherley, LaGrange, Ky.						
64790	Tiger Brand Phosphate	Manufacturer's warehouse........	17.80	3.80	21.60	21.4	64790
			16.00	*2.00*	*18.00*	*19.2*	
	The Empire Guano Co., Nashville, Tenn.						
63278	High Grade Acid Phosphate	Manufacturer	17.20	1.90	19.10	20.6	63278
			14.00	*4.00*	*18.00*	*16.8*	
64215	Climax Acid Phosphate	Young Hardware Co., Hopkinsville	20.30	0.65	20.95	24.4	64215
64216		C. I. Medaris, Esto...............	17.95	2.25	20.20	21.5	64216
64643		G. W. Collins, Glens Fork.........	16.50	3.50	20.00	19.8	64643
64793		Calloway County Farm Bureau, Murray	17.90	3.90	21.80	21.5	64793
			16.00	*2.00*	*18.00*	*19.2*	

	The Evansville Packing Co., Evansville, Ind.						
64217	H. Gr. Acid Phosphate	Atherton-Kidd Co., Livermore.....	17.00	0.60	17.60	20.4	64217
64218		C. B. Carden and Co., Hartford...	16.70	0.50	17.20	20.0	64218
			16.00			*19.2*	
	Federal Chemical Co., Inc., Louisville, Ky.						
64236	Daybreak H. Gr. Phosphate	Birk and Price Co., Owensboro....	17.20	2.00	19.20	20.6	64236
64237		Burks and Anderson, Monticello...	16.85	0.90	17.75	20.2	64237
64647		A. W. Tarter, Columbia..........	18.50	1.20	19.70	22.2	64647
64648		Grayson County Supply Co., Leitchfield	17.45	0.35	17.80	20.9	64648
			16.00	*2.00*	*18.00*	*19.2*	
63688	Daybreak Royal Phosphate	Manufacturer	16.60	3.70	20.30	19.9	63688
			14.00	*2.00*	*16.00*	*16.8*	
63689	Daybreak Standard Phosphate	Manufacturer	14.55	7.40	21.95	17.5	63689
			12.00	*2.00*	*14.00*	*14.4*	
63690	Daybreak Special Phosphate Mixture	Manufacturer	12.70	9.40	22.10	15.2	63690
			10.00	*10.00*	*20.00*	*12.0*	
63717	Extra H. Gr. Phosphate	Manufacturer	18.30	0.25	18.55	22.0	63717
			18.00	*2.00*	*20.00*	*21.6*	
63719	Blue Bull Phosphate	Manufacturer	18.40	0.25	18.65	22.1	63719
			16.00			*19.2*	
63996	A A Phosphate	Manufacturer	12.20	3.50	15.70	14.6	63996
			10.00	*2.00*	*12.00*	*12.0*	
64261	1st Prize H. Gr. Phosphate	Bob Humphrey, Central City......	19.05	0.90	19.95	22.9	64261
64657		Stewart and Co., Munfordville....	18.00	0.90	18.90	21.6	64657
64658		Farmers' Union Supply Co., Russelville	16.95	1.15	18.10	20.3	64658
			16.00	*2.00*	*18.00*	*19.2*	
63740	1st Prize Phosphate	Manufacturer	16.60	3.70	20.30	19.9	63740
			14.00	*2.00*	*16.00*	*16.8*	
63741	1st Prize Standard Phosphate	Manufacturer	14.55	7.40	21.95	17.5	63741
			12.00	*2.00*	*14.00*	*14.4*	
63742	1st Prize Special Phosphate Mixture	Manufacturer	12.70	9.40	22.10	15.2	63742
			10.00	*10.00*	*20.00*	*12.0*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID Available	PHOSPHORIC ACID Insoluble	PHOSPHORIC ACID Total	Index of Relative Value	Station Number.
	Fox Chemical Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.						
64270	Fox H. Gr. Phosphate	J. S. Whitfill, Big Clifty	16.00	1.20	17.20	19.2	64270
64271		K. J. McKenney, Brodhead	16.90	0.70	17.60	20.3	64271
64661		Ed Foster, Liberty......	18.45	0.55	19.00	22.1	64661
			16.00	*2.00*	*18.00*	*19.2*	
64272	Fox Phosphate	J. S. Whitfill, Big Clifty..........	14.90	0.70	15.60	17.9	64272
			14.00	*2.00*	*16.00*	*16.8*	
63798	Fox Standard Phosphate	Manufacturer	14.55	7.40	21.95	17.5	63798
			12.00	*2.00*	*14.00*	*14.4*	
63799	Fox Special Phosphate Mixture	Manufacturer	12.70	9.40	22.10	15.2	63799
			10.00	*10.00*	*20.00*	*12.0*	
	Globe Fert. Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.						
64067	Globe H. Gr. Phosphate	J. B. Gardner, Murray............	17.75	2.30	20.05	21.3	64067
64068		J. B. Gardner, Murray...........	17.85	1.75	19.60	21.4	64068
64291		J. H. Carter, Strode..............	17.35	0.55	17.90	20.8	64291
64668		Farmers' Union Supply Co., Bowling Green	17.50	1.05	18.55	21.0	64668
64669		Burton and Pyles, Ella...........	16.95	1.60	18.55	20.3	64669
			16.00	*2.00*	*18.00*	*19.2*	
64292	Globe Phosphate	I. K. Miller and Sons, Campbellsville	16.20	1.65	17.85	19.4	64292
			14.00	*2.00*	*16.00*	*16.8*	
64293	Globe Standard Phosphate	I. K. Miller and Sons, Campbellsville	13.15	0.75	13.90	15.8	64293
			12.00	*2.00*	*14.00*	*14.4*	
63830	Globe Special Phosphate Mixture	Manufacturer	12.70	9.40	22.10	15.2	63830
			10.00	*10.00*	*20.00*	*12.0*	

	Groves Fertilizer Works, Cincinnati, Ohio						
64311	16% Acid Phosphate	S. V. Kissee, Ingle..............	17.35	1.50	18.85	20.8	64311
64676		T. Z. Leachman, Greensburg......	16.45	2.05	18.50	19.7	64676
64677		J. C. Everett and Co., Maysville...	17.05	2.15	19.20	20.5	64677
			16.00	*1.00*	*17.00*	*19.2*	
64312	Monarch Brand	J. F. Collings, Shepherdsville......	13.35	1.25	14.60	16.0	64312
64678		I. K. Miller and Sons, Campbellsville	14.35	1.95	16.30	17.2	64678
			14.00	*1.00*	*15.00*	*16.8*	
	Hall Seed Co., Louisville, Ky.						
64679	Halco Acid Phosphate	Dulworth and Durham, Greensburg	15.70	1.70	17.40	18.8	64679
			16.00	*1.00*	*17.00*	*19.2*	
64680	Halco 14% Phosphate	Dulworth and Durham, Greensburg	13.95	2.25	16.20	16.7	64680
			14.00	*2.00*	*16.00*	*16.8*	
	Hopkins Fertilizer Co., New Albany, Ind.						
64325	Climax Acid Phosphate	Conner, Hayden and Co., Bardstown	18.80	2.70	21.50	22.6	64325
64326		Floyd Nealy, Glasgow............	18.10	2.90	21.00	21.7	64326
64686		J. J. Eskridge, Leitchfield........	17.00	3.20	20.20	20.4	64686
			16.00	*2.00*	*18.00*	*19.2*	
	International Agri. Corp., Inc., Cincinnati, O.						
63424	I. A. C. Extra H. Gr. Acid Phosphate	Manufacturer	18.70	3.55	22.25	22.4	63424
			18.00	*1.00*	*19.00*	*21.6*	
64333	I. A. C. Standard Acid Phosphate	C. M. Langdon, Science Hill......	18.10	2.30	20.40	21.7	64333
64334		V. B. Nichols, Elkton............	18.50	2.20	20.70	22.2	64334
64693		C. M. Langdon, Science Hill......	18.15	2.10	20.25	21.8	64693
64694		Eldred Hardware Co., Princeton...	16.20	2.00	18.20	19.4	64694
			16.00	*2.00*	*18.00*	*19.2*	
64335	I. A. C. Dissolved Phosphate	C. M. Langdon, Science Hill......	15.10	3.40	18.50	18.1	64335
			14.00	*2.00*	*16.00*	*16.8*	
63442	Buffalo 18% Acid Phosphate	Manufacturer	18.70	3.55	22.25	22.4	63442
			18.00	*1.00*	*19.00*	*21.6*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	International Agricultural Corp.						
64343	Buffalo 16% Acid Phosphate	Tartar-Ham and Co., Somerset....	17.55	2.90	20.45	21.1	64343
64698		M. R. Wheldon, Waynesburg......	17.85	2.00	19.85	21.4	64698
64699		London Hardware Co., London....	17.60	2.85	20.45	21.1	64699
			16.00	*2.00*	*18.00*	*19.2*	
64344	Buffalo Dissolved Phosphate	Tarter-Ham and Co., Somerset....	15.55	4.40	19.95	18.7	64344
64345		R. Y. Ballard, Waynesburg.......	14.80	4.70	19.50	17.8	64345
			14.00	*2.00*	*16.00*	*16.8*	
	The Jarecki Chemical Co., (Armour owned). Cincinnati, O						
64352	Acid Phosphate	C. L. and F. F. Dudley, Flemingsburg	16.55	0.95	17.50	19.9	64352
64353		J. E. Cain, Hogue................	15.25	2.30	17.55	18.3	64353
64700		Fred Evans, Tompkinsville........	15.45	1.80	17.25	18.5	64700
			16.00	*1.00*	*17.00*	*19.2*	
63598	Acid Phosphate	Manufacturer	20.75	1.75	22.50	24.9	63598
			20.00	*1.00*	*21.00*	*24.0*	
	The Kaufman Fert. Co., (Owned and operated by Armour Fert. Works), Cincinnati, O.						
64361	Acid Phosphate	James Roe, Mouth of Laurel......	16.85	0.60	17.45	20.2	64361
			16.00	*1.00*	*17.00*	*19.2*	
63645	Acid Phosphate	Manufacturer	20.75	1.75	22.50	24.9	63645
			20.00	*1.00*	*21.00*	*24.0*	

	Ky. Fert. Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.						
64370	O. K. High Grade Phosphate	J. L. Siler, Corbin	17.55	0.55	18.10	21.1	64370
64371		T. G. Moren, London	16.10	0.90	17.00	19.3	64371
64704		Smith and Smith, Shepherdsville	17.75	0.40	18.15	21.3	64704
64705		C. M. Hill, Cecelia	17.25	1.00	18.25	20.7	64705
			16.00	*2.00*	*18.00*	*19.2*	
64372	O. K. Phosphate	L. R. Hart, Big Clifty	15.95	0.80	16.75	19.1	64372
			14.00	*2.00*	*16.00*	*16.8*	
64706	O. K. Standard Phosphate	Smith and Smith, Shepherdsville	12.70	0.50	13.20	15.2	64706
			12.00	*2.00*	*14.00*	*14.4*	
63858	O. K. Special Phosphate Mixture	Manufacturer	12.70	9.40	22.10	15.2	63858
			10.00	*10.00*	*20.00*	*12.0*	
	Louisville Fert. Co., (Armour owned). Lou., Ky., Cin., O., Nash., Tenn.						
64290	Sixteen Per Cent	Elkin and Kimmel, Greenville	15.55	2.10	17.65	18.7	64290
64394		Hurst Brown Hardware Co., Bardstown	16.70	1.70	18.40	20.0	64394
64395		G. D. James, Rocky Hill	17.90	2.05	19.95	21.5	64395
64716		S. E. Redford, Glasgow	16.30	1.75	18.05	19.6	64716
64717		S. A. Browning, Vanceburg	16.35	1.15	17.50	19.6	64717
			16.00	*1.00*	*17.00*	*19.2*	
64396	Twenty Per Cent	Durham Produce Co., Columbia	19.95	1.60	21.55	23.9	64396
			20.00	*1.00*	*21.00*	*24.0*	
64719	Louisville Fourteen Per Cent	Ratliff Hdw. Co., Princeton	13.50	2.35	15.85	16.2	64719
			14.00	*1.00*	*15.00*	*16.8*	
	Morris and Co., Chicago, Ill.						
64829	Morris H. Gr. Acid Phosphate	Manufacturer	15.95	1.15	17.10	19.1	64829
			16.00			*19.2*	

Table III.—Acid Phosphates.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	Mt. Pleasant Fert. Co., Inc., Mt. Pleasant, Tenn.						
64400	Mt. Pleasant Big Winner Acid Phosphate	Farmers Union Supply Co., Franklin	17.90	1.80	19.70	21.5	64400
64401		Grigsby and Co., Bardstown......	18.55	0.85	19.40	22.3	64401
64723		Cayce-Yost Co., Hopkinsville......	18.80	4.20	23.00	22.6	64723
64724		Egner and Vaughn, Benton.......	17.40	1.40	18.80	20.9	64724
			16.00	*2.00*	*18.00*	*19.2*	
63649	Black Patch Mt. Pleasant Spl. Acid Phosphate	Manufacturer	16.00	3.30	19.30	19.2	63649
			14.00	*2.00*	*16.00*	*16.8*	
63650	Black Patch Mt. Pleasant Soluble Bone	Manufacturer	12.45	9.30	21.75	14.9	63650
			12.00	*2.00*	*14.00*	*14.4*	
63651	Mt. Pleasant Acid Phosphate	Manufacturer	10.85	13.25	24.10	13.0	63651
			10.00	*2.00*	*12.00*	*12.0*	
64555	Mt. Pleasant H. Gr. Acid Phosphate	Manufacturer	21.20	0.65	21.85	25.4	64555
			20.00	*2.00*	*22.00*	*24.0*	
	The Peerless Chemical Co., Columbia, Tenn.						
64065	16% Peerless Acid Phosphate	J. B. Gardner, Murray...........	17.20	2.80	20.00	20.6	64065
64066		J. B. Gardner, Murray...........	16.15	3.35	19.50	19.4	64066
64076		Harry Gatton, Elizabethtown......	18.35	2.15	20.50	22.0	64076
64408		Warren Co. Farm Bureau, Bowling Green	17.85	2.80	20.65	21.4	64408

64409		Barren Co. Farm Bureau, Glasgow.	17.80	2.50	20.30	21.4	64409
64653		W. H. Adams, Olmstead..........	15.90	4.05	19.95	19.1	64653
64727		Allen Co. Farm Bureau, Scottsville	18.20	2.30	20.50	21.8	64727
64728		Fred Kelly, Bowling Green........	18.70	1.80	20.50	22.4	64728
64801		St. Matthews Produce Exchange, St. Matthews	19.60	1.80	21.40	23.5	64801
			16.00			*19.2*	
	Price Chemical Co., Inc., Louisville, Ky.						
64422	H. Gr. Phosphate	W. A. Johnson, Brodhead.........	15.40	1.50	16.90	18.5	64422
64423		G. W. Richardson, Somerset....	16.75	1.65	18.40	20.1	64423
64731		Peoples Store, Loretto...........	17.70	0.30	18.00	21.2	64731
64732		Farmers Union Supply Co., Glasgow	18.60	1.40	20.00	22.3	64732
			16.00	*2.00*	*18.00*	*19.2*	
63965	Acid Phosphate	Manufacturer	22.40	0.70	23.10	26.9	63965
			14.00	*2.00*	*16.00*	*16.8*	
	Rainbow Guano Co., (Sub. of Int. Agri. Corp.) Florence, Ala.						
63744	Rainbow Pure H. Gr. Acid Phosphate	Manufacturer	17.40	0.80	18.20	20.9	63744
			16.00	*1.00*	*17.00*	*19.2*	
	Rasin-Monumental Co., (Sub. of Va.-Car. Chem. Co., Inc.,) Cin., Ohio						
64425	Rasin's 16% Acid Phosphate	R. D. Robinson, Mayfield.........	19.20	0.85	20.05	23.0	64425
64426		J. H. Wyan, London..............	17.95	2.35	20.30	21.5	64426
64733		J. H. Wyan, London..............	18.20	1.90	20.10	21.8	64733
64734		Lessenbery and Jones, Glasgow....	17.70	4.00	21.70	21.2	64734
			16.00	*1.50*	*17.50*	*19.2*	
64735	Rasin's 20% Acid Phosphate	J. H. Wyan, London..............	21.30	1.80	23.10	25.6	64735
			20.00	*1.50*	*21.50*	*24.0*	
63908	Rasin's 24% Acid Phosphate						63908
			24.00	*1.50*	*25.50*	*28.8*	
63923	Rasin's Phospho Tobacco	Manufacturer	19.90	1.30	21.20	28.9	63923
			16.00	*1.50*	*17.50*	*19.2*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID Available	PHOSPHORIC ACID Insoluble	PHOSPHORIC ACID Total	Index of Relative Value	Station Number.
	Read Phosphate Co., Nashville, Tenn.						
64430	XXX Dissolved Bone	Hatcher and Rawls, Cerulean......	18.60	2.00	20.60	22.3	64430
64738		U. G. Antle, Columbia............	16.30	4.00	20.30	19.6	64738
			12.00	*6.00*	*18.00*	*14.4*	
64431	High Grade Acid Phosphate	Hatcher and Rawls, Cerulean......	18.05	2.45	20.50	21.7	64431
			14.00	*4.00*	*18.00*	*16.8*	
64432	Special High Grade Acid Phosphate	Lester-Crawford and Baugh, Science Hill	18.50	1.50	20.00	22.2	64432
64433		Hollingsworth - Young Hdw. Co., Bowling Green	18.75	1.90	20.65	22.5	64433
64739		J. H. Jasper, Somerset............	19.00	2.80	21.80	22.8	64739
64740		B. F. Beard and Co., Hardinsburg..	17.60	4.00	21.60	21.1	64740
			16.00	*2.00*	*18.00*	*19.2*	
	The Smith Agricultural Chem. Co., Columbus, O.						
64031	Smith's 16% Acid Phosphate	Manufacturer	17.05	0.35	17.40	20.5	64031
			16.00			*19.2*	
64040	Smith's 20% Acid Phosphate	Manufacturer	21.70	0.30	22.00	26.0	64040
			20.00			*24.0*	
	Southern Agricultural Chem. Corp., Atlanta, Ga.						
63772	High Grade Acid Phosphate	Manufacturer	18.30	0.90	19.20	22.0	63772
			16.00			*19.2*	

	Southern Fertilizer Co., Inc., Louisville, Ky.						
64450	Atlas Phosphate	Conrad-Payne and Co., Cloverport.	16.25	0.55	16.80	19.5	64450
			16.00			*19.2*	
	Southern Fertilizer and Chemical Co., Savannah, Ga.						
63748	Southern Acid Phosphate 16%	Manufacturer	17.00	0.50	17.50	20.4	63748
			16.00	*0.50*	*16.50*	*19.2*	
	Swift and Co., National Stock Yards, Ill.						
64471	Swift's H. Gr. Acid Phosphate Fertilizer	Rufus Tarter, Oil Center.........	18.05	0.65	18.70	21.7	64471
64472		E. M. Ford and Sons, Cave City..	17.80	0.50	18.30	21.4	64472
64752		E. M. Ford and Sons, Cave City..	18.50	0.50	19.00	22.2	64752
64808		W. S. Overstreet, LaGrange......	16.40	2.80	19.20	19.7	64808
			16.00			*19.2*	
64534	Swift's Red Steer 20% Acid Phosphate	Manufacturer	23.15	0.35	23.50	27.8	64534
			20.00	*1.00*	*21.00*	*24.0*	
	Taylor and Powell Fertilizer Co., Inc., Springfield, Tenn.						
64051	16% Acid Phosphate	Manufacturer	15.95	1.75	17.70	19.1	64051
			16.00			*19.2*	
	Tennessee Chemical Co., (Armour owned). Lou., Ky., Cin., O., Nash., Tenn.						
64490	Ox Sixteen Per Cent	The Young Co., Columbia.........	17.35	1.55	18.90	20.8	64490
64491		P. A. Blackwell and Co., Henderson	16.30	1.80	18.10	19.6	64491
64758		Dickinson Bros., Glasgow.........	17.00	2.20	19.20	20.4	64758
64759		Marion Milling Co., Marion......	17.60	1.00	18.60	21.1	64759
			16.00	*1.00*	*17.00*	*19.2*	

TABLE III.—ACID PHOSPHATES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	PHOSPHORIC ACID			Index of Relative Value	Station Number.
			Available	Insoluble	Total		
	Tennessee Chemical Co.						
63560	Ox Twenty Per Cent	Manufacturer	22.50	0.50	23.00	27.0	63560
			20.00	*1.00*	*21.00*	*24.0*	
64760	Ox Fourteen Per Cent	F. M. Mitchell, Scottsville	15.10	2.40	17.50	18.1	64760
			14.00	*1.00*	*15.00*	*16.8*	
64761	Ox Twelve Per Cent Phosphate	J. M. Johnson, Benton	13.90	2.40	16.30	16.7	64761
			12.00	*1.00*	*13.00*	*14.4*	
	Tennessee Coal, Iron and Railroad Co., Birmingham, Ala.						
64495	Duplex Basic Phosphate	Farmers Union Supply Co., Franklin			18.45	22.1	64495
64496		Farmers Union Supply Co., Somerset			18.85	22.6	64496
64764		Farmers Union Supply Co., Glasgow			18.50	22.2	64764
64765		Taylor County Supply Co., Campbellsville			18.30	22.0	64765
					18.00	*21.60*	
63246	14% Duplex Basic Phosphate	Manufacturer			13.45	16.1	63246
					14.00	*16.8*	
63247	12% Duplex Basic Phosphate						63247
					12.00	*14.4*	
	Tupelo Fertilizer Factory, Tupelo, Miss.						
64046	Cotton Belt H. Gr. Acid Phosphate	Manufacturer	19.65	1.45	21.10	23.6	64046
			16.00	*1.00*	*17.00*	*19.2*	

64047	Tupelo Special H. Gr. Acid Phosphate	Manufacturer	20.10	0.10	20.20	24.1	64047
			18.00	*1.00*	*19.00*	*21.6*	
	Victor Guano Co., Nashville, Tenn.						
63292	High Grade Acid Phosphate	Manufacturer	17.20	1.90	19.10	20.6	63292
			14.00	*4.00*	*18.00*	*16.8*	
64498	Special High Grade Acid Phosphate	Lambert-Gresham Hdw. Co., Henderson	19.65	0.85	20.50	23.6	64498
64499		L. F. Hubble, Somerset	18.10	2.10	20.20	21.7	64499
64766		L. F. Hubble, Somerset	17.50	3.70	21.20	21.0	64766
			16.00	*2.00*	*18.00*	*19.2*	
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.						
64500	V-C 16% Acid Phosphate	Wayne County Farm Bureau, Monticello	17.55	1.00	18.55	21.1	64500
64501		Taylor County Supply Co., Campbellsville	18.60	1.90	20.50	22.3	64501
64767		Thurman and Enlow, Hodgenville	19.40	3.00	22.40	23.3	64767
64768		Taylor County Supply Co., Campbellsville	19.70	3.30	23.00	23.6	64768
			16.00	*1.50*	*17.50*	*19.2*	
64502	V-C 20% Acid Phosphate	Vine Grove Feed Co.. Vine Grove	22.40	1.70	24.10	26.9	64502
64503		R. H. Chrisman, Berea	21.30	1.90	23.20	25.6	64503
			20.00	*1.50*	*21.50*	*24.0*	
63882	V-C 24% Acid Phosphate						63882
			24.00	*1.50*	*25.50*	*28.8*	
63883	V-C Phospho Tobacco	Manufacturer	19.90	1.30	21.20	23.9	63883
			16.00	*1.50*	*17.50*	*19.2*	
64774	V-C 14% Acid Phosphate	C. B. Cardon and Co., Hartford	15.60	8.00	23.60	18.7	64774
			14.00	*2.00*	*16.00*	*16.8*	
	Wood, Stubbs and Co., Inc., Louisville, Ky.						
64005	Acme High Grade Phosphate						64005
			16.00	*2.00*	*18.00*	*19.2*	

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number.	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	PHOSPHORIC ACID			POTASH		Index of Relative Value	Station Number.
			Available	Insoluble	Total	From Muriate	From Sulphate		
	A. D. Adair and McCarty Bros., Inc., Atlanta, Ga., Chattanooga, Tenn.								
63754	Adair's Formula	Manufacturer	10.30	0.30	10.60	1.76		20.9	63754
			10.00			*2.00*		*21.0*	
63834	Adair's High Grade Potash Compound	Manufacturer	10.50	0.40	10.90	4.03		28.0	63834
			10.00			*4.00*		*27.0*	
	The American Agri. Chem. Co., Inc., Cincinnati, O.								
63298	A. A. C. High Grade Bone and Potash	Manufacturer	11.00	1.00	12.00	5.42		33.2	63298
			10.00	*2.00*	*12.00*	*5.00*		*30.8*	
64101	Bowker's Dissolved Bone With Potash	Jones and Harrison, Allegree	12.60	1.15	13.75	2.19		25.9	64101
64589		S. D. Harlin, Gamaliel	11.05	1.00	12.05	2.29		23.9	64589
64590		Jones and Harrison, Allegree	10.95	1.05	12.00	2.29		23.7	64590
			10.00	*2.00*	*12.00*	*2.00*		*21.8*	
63306	Bowker's Acid Phosphate and Potash	Manufacturer	12.70	0.80	13.50	2.20		26.0	63306
			12.00	*2.00*	*14.00*	*2.00*		*24.8*	
64111	Bowker's Potash Fertilizer	R. L. McFerron, Mt. Vernon	11.70	0.70	12.40	5.14	0.72	35.4	64111
64595		T. E. Richardson, Campbellsville	10.85	1.00	11.85	5.22		32.3	64595
64596		Mayhew and Gilbert, Franklin	11.60	1.00	12.60	4.92		32.6	64596
			10.00	*2.00*	*12.00*	*5.00*		*30.8*	

63322	Bradley's Alkaline Bone with Potash	Manufacturer	10.95 *10.00*	0.95 *2.00*	11.90 *12.00*	2.06 *2.00*		23.0 *21.8*	63322
63323	Bradley's Twelve-Two	Manufacturer	12.70 *12.00*	0.80 *2.00*	13.50 *14.00*	2.20 *2.00*		26.0 *24.8*	63323
63339	Cleveland Dryer Works, Soluble Bone with Potash	Manufacturer	10.95 *10.00*	0.95 *2.00*	11.90 *12.00*	2.06 *2.00*		23.0 *21.8*	63339
63340	Cleveland Dryer Works Twelve-Two	Manufacturer	12.70 *12.00*	0.80 *2.00*	13.50 *14.00*	2.20 *2.00*		26.0 *24.8*	63340
64121	Red Line Phosphate with Potash	E. Farris and Co., Cave City	11.65 *10.00*	0.60 *2.00*	12.25 *12.00*	1.22 *2.00*	1.15	24.8 *21.8*	64121
63357	Michigan Carbon Works Twelve-Two	Manufacturer	12.70 *12.00*	0.80 *2.00*	13.50 *14.00*	2.20 *2.00*		26.0 *24.8*	63357
64133	Michigan Carbon Works High Potash Phos.	Albert Long, Scottsville....	11.65 *10.00*	0.65 *2.00*	12.30 *12.00*	4.42 *5.00*	1.07	34.2 *30.8*	64133
63375	N-W Horseshoe Br. Bone with Potash	Manufacturer	10.95 *10.00*	0.95 *2.00*	11 90 *12.00*	2.06 *2.00*		23.0 *21.8*	63375
63376	N-W Horseshoe Brand Twelve-Two	Manufacturer	12.70 *12.00*	0.80 *2.00*	13.50 *14.00*	2.20 *2.00*		26.0 *24.8*	63376
63388	N-W Horseshoe Brand 10 5 Potash Manure	Manufacturer	11.00 *10.00*	1.00 *2.00*	12.00 *12.00*	5.42 *5.00*		33.2 *30.8*	63388
63394	Packer's Boars Head Br. Ky. Potash Mixture	Manufacturer	10.95 *10.00*	0.95 *2.00*	11.90 *12.00*	2.06 *2.00*		23.0 *21.8*	63394
63395	Packer's Boars Head Br. Twelve-Two	Manufacturer	12.70 *12.00*	0.80 *2.00*	13.50 *14.00*	2.20 *2.00*		26.0 *24.8*	63395
63407	Packer's Boars Head Br. Potash Phosphate Fertilizer	Manufacturer	11.00 *10.00*	1.00 *2.00*	12.00 *12.00*	5.42 *5.00*		33.2 *30.8*	63407

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number.	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	PHOSPHORIC ACID			POTASH		Index of Relative Value	Station Number.
			Available	Insoluble	Total	From Muriate	From Sulphate		
	Armour Fertilizer Works, Lou., Ky., Cin., O., Nash., Tenn.								
64161	Armour's Big Crop Ten-Ten	Joe Waddle, Munfordville.	10.00 *10.00*	1.50 *1.00*	11.50 *11.00*	10.86 *10.00*		48.2 *45.4*	64161
64162	Armour's Big Crop Phosphate and Potash	Thurman and Enlow, Hodgenville	12.20 *12.00*	0.20 *1.00*	12.40 *13.00*	2.03 *2.00*		24.5 *24.4*	64162
63510	Armour's Big Crop Potash Formula	Manufacturer	12.70 *12.00*	1.50 *1.00*	14 20 *13.00*	4.89 *4.00*		34.3 *30.4*	63510
64179	Armour's Potash Mixture	Cadiz Hardware Co., Cadiz.	9.65 *10.00*	7.10 *1.00*	16.75 *11.00*	2.38 *2.00*		24.5 *21.4*	64179
64630	Armour's Big Crop Wheat Grower	Cayce-Yost Co., Hopkinsvill	9.80 *10.00*	1.80 *1.00*	11.60 *11.00*	5.10 *5.00*		30.7 *30.4*	64630
	Calumet Fertilizer Co., New Albany, Ind.								
64190	Calumet Brand Phosphate and Potash	Sturgis Impl. and Hdw. Co., Sturgis	11.35 *10.00*	0.45 *4.00*	11.80 *14.00*	0.54 *2.00*	1.06	22.0 *22.6*	64190

64191	Calumet Brand Ten Five	Frank Baker, Clarkson.....	11.80	0.80	12.60	1.28	3.35	31.9	64191
			10.00	*4.00*	*14.00*	*5.00*		*31.6*	
	The Cincinnati Phosphate Co., (Owned and operated by Armour Fert. Works), Cin., O.								
63611	Dissolved Phosphate and Potash	Manufacturer	12.30	1.40	13.70	4.29		31.9	63611
			12.00	*1.00*	*13.00*	*4.00*		*30.4*	
63612	Alkaline Phosphate	Manufacturer	12.10	1.40	13.50	2.00		24.7	63612
			12.00	*1.00*	*13.00*	*2.00*		*24.4*	
63623	Ten Ten Fertilizer	Manufacturer	10.10	1.00	11.10	10.46		46.9	63623
			10.00	*1.00*	*11.00*	*10.00*		*45.4*	
	Consolidated Chemical Co., Louisville, Ky.								
63988	Camel Brand Potash Tobacco Fertilizer	Manufacturer	11.70	0.70	12.40	0.94	5.05	35.8	63988
			10.00	*2.00*	*12.00*		*5.00*	*30.8*	
63989	Camel Brand Phosphate and Potash	Manufacturer	11.40	0.50	11.90	0.54	2.09	25.2	63989
			10.00	*2.00*	*12.00*		*2.00*	*21.8*	
	Darling and Co., Chicago, Ill.								
64070	Darling's Ten Five								64070
			10.00	*1.00*	*11.00*	*5.00*		*30.4*	
	The Empire Guano Co., Nashville, Tenn.								
64642	Bone and Potash	G. W. Collins, Glen's Fork..	12.05	6.80	18.85	1.52	0.51	26.9	64642
			10.00	*8.00*	*18.00*	*2.00*		*24.2*	
63277	H. Gr. Potash Phosphate	Manufacturer	12.45	3.05	15.50	3.57		30.6	63277
			10.00	*7.00*	*17.00*	*4.00*		*29.8*	

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number.	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	PHOSPHORIC ACID			POTASH		Index of Relative Value	Station Number.
			Available	Insoluble	To	From Muriate	From Sulphate		
	The Evansville Packing Co., Evansville, Ind.								
63450	Phosphate and Potash	Manufacturer	15.00	0.15	15.15	2.83		31.1	63450
			10.00			*2.00*		*21.0*	
	Federal Chemical Co., Inc., Louisville, Ky.								
63683	Daybreak Champion Potash Fertilizer	Manufacturer	11.20	11.80	23.00		2.85	30.1	63683
			8.00	*8.00*	*16.00*		*2.00*	*21.2*	
64235	Daybreak Potash Special	Burks and Anderson, Monticello	10.60	0.80	11.40	1.76		21.5	64235
			10.00	*2.00*	*12.00*		*2.00*	*21.8*	
63685	Daybreak Potash Mixture	Manufacturer	11.85	7.75	19.60		4.93	35.7	63685
			10.00	*2.00*	*12.00*		*4.00*	*27.8*	
63686	Daybreak Phosphate and Potash	Manufacturer	15.30	3.80	19.10		2.97	33.4	63686
			12.00	*2.00*	*14.00*		*2.00*	*24.8*	
63712	Double Phosphate and Potash Formula	Manufacturer	11.60	8.80	20.40		4.25	33.7	63712
			8.00	*8.00*	*16.00*		*4.00*	*27.2*	
63713	Potash Special	Manufacturer	13.75	6.90	20.65		2.68	31.4	63713
			10.00	*2.00*	*12.00*		*2.00*	*21.8*	
63714	Potash Mixture	Manufacturer	12.45	7.60	20.05		4.85	36.3	63714
			10.00	*2.00*	*12.00*		*4.00*	*27.8*	
63715	Potash Compound	Manufacturer	15.30	3.80	19.10		2.97	33.4	63715
			12.00	*2.00*	*14.00*		*2.00*	*24.8*	

64795	Black Land Special	St. Matthews Produce Exchange, St. Matthews....	14.60	0.80	15.40		4.18	34.8	64795
			12.00	*2.00*	*14.00*		*4.00*	*30.8*	
63738	Mogul Potash Fertilizer	Manufacturer	11.20	11.80	23.00		2.85	30.1	63738
			8.00	*8.00*	*16.00*		*2.00*	*21.2*	
	Fox Chem. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.								
63792	Fox Ideal Potash Fertilizer	Manufacturer	11.20	11.80	23.00		2.85	30.1	63792
			8.00	*8.00*	*16.00*		*2.00*	*21.2*	
63793	Fox Potash Special	Manufacturer	13.80	7.20	21.00		2.64	31.5	63793
			10.00	*2.00*	*12.00*		*2.00*	*21.8*	
63794	Fox Bone Phosphate and Potash	Manufacturer	11.85	7.75	19.60		4.93	35.7	63794
			10.00	*2.00*	*12.00*		*4.00*	*27.8*	
63795	Fox Bone Phosphate	Manufacturer	15.30	3.80	19.10		2.97	33.4	63795
			12.00	*2.00*	*14.00*		*2.00*	*24.8*	
	Globe Fert. Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.								
63823	Globe Tip Top Potash Fertilizer	Manufacturer	11.20	11.80	23.00		2.85	30.1	63823
			8.00	*8.00*	*16.00*		*2.00*	*21.2*	
63824	Globe Potash Special	Manufacturer	13.80	7.20	21.00		2.64	31.5	63824
			10.00	*2.00*	*12.00*		*2.00*	*21.8*	
64667	Globe Bone Phosphate and Potash	Hutchenson Bros., Auburn ..	11.20	2.45	13.65	3.65		28.7	64667
			10.00	*2.00*	*12.00*		*4.00*	*27.8*	
63826	Globe Potash Compound	Manufacturer	15.30	3.80	19.10		2.97	33.4	63826
			12.00	*2.00*	*14.00*		*2.00*	*24.8*	
	Groves Fertilizer Works, Cincinnati, O.								
64013	Corn and Tobacco	Manufacturer	10.90	0.50	11.40	2.04		22.7	64013
			10.00	*1.00*	*11.00*	*2.00*		*21.4*	

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number.	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	PHOSPHORIC ACID			POTASH		Index of Relative Value	Station Number.
			Available	Insoluble	Total	From Muriate	From Sulphate		
	Groves Fertilizer Works, Cincinnati, O.								
64303	Phosphate and Potash	Minges Hardware Co., Newport	10.05 *10.00*	1.70 *1.00*	11.75 *11.00*	**2.89** *4.00*		**24.4** *27.4*	64303
64304	Ten and Ten	J. O. McAninch, Joyce	11.35 *10.00*	1.50 *1.00*	12.85 *11.00*	4.52 *10.00*	5.64	48.1 *45.4*	64304
	Hopkins Fertilizer Co., New Albany, Ind.								
64533	Double Action		*11.00*	*2.00*	*13.00*	*3.00*		*26.3*	64533
	International Agricultural Corp., Inc., Cincinnati, O.								
64691	I. A. C. Standard Potash Mixture	V. B. Nuckols, Elkton	10.95 *10.00*	1.55 *5.00*	**12.50** *15.00*	4.44 *5.00*		**30.4** *32.0*	64691
64692	I. A. C. Potash Fertilizer	Sturgis Impl. and Hdw. Co. Sturgis	13.05 *12.00*	1.25 *5.00*	**14.30** *17.00*	2.37 *2.00*		27.3 *26.0*	64692
63440	Buffalo Potash Mixture	Manufacturer	10.70 *10.00*	2.20 *5.00*	**12.90** *15.00*	5.11 *5.00*		32.3 *32.0*	63440
63441	Buffalo Phosphate and Potash	Manufacturer	13.40 *12.00*	3.55 *5.00*	16.95 *17.00*	0.74 *2.00*	1.36	27.7 *26.0*	63441

	The Jarecki Chem. Co., (Armour owned). Cincinnati, O.								
63586	Super Phosphate and Potash	Manufacturer	12.30	1.40	13.70		4.29	31.9	63586
			12.00	*1.00*	*13.00*	*4.00*		*30.4*	
63587	Phosphate and Potash	Manufacturer	12.10	1.40	13.50	2.00		24.7	63587
			12.00	*1.00*	*13.00*	*2.00*		*24.4*	
63597	Big Ben Ten Ten	Manufacturer	10.10	1.00	11.10	10.46		46.9	63597
			10.00	*1.00*	*11.00*	*10.00*		*45.4*	
	The Kaufman Fert. Co. (Owned and operated by Armour Fert. Works). Cincinnati, O.								
63634	Dissolved Phosphate and Potash	Manufacturer	12.30	1.40	13.70	4.29		31.9	63634
			12.00	*1.00*	*13.00*	*4.00*		*30.4*	
63635	Alkaline Phosphate	Manufacturer	12.10	1.40	13.50	2.00		24.7	63635
			12.00	*1.00*	*13.00*	*2.00*		*24.4*	
63646	Ten Ten Fertilizer	Manufacturer	10.10	1.00	11.10	10.46		46.9	63646
			10.00	*1.00*	*11.00*	*10.00*		*45.4*	
	Ky. Fert. Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.								
63853	Gold Metal Potash Fertilizer	Manufacturer	11.20	11.80	23.00		2.85	30.1	63853
			8.00	*8.00*	*16.00*		*2.00*	*21.2*	
63854	O. K. Potash Special	Manufacturer	13.80	7.20	21.00		2 64	31.5	63854
			10.00	*2.00*	*12.00*		*2.00*	*21.8*	
	Louisville Fert. Co., Armour owned). Lou., Ky., Cin., O., Nash., Tenn.								
63475	Phosphate and Potash	Manufacturer	12.50	2.05	14.55	2.18		26.1	63475
			12.00	*1.00*	*13.00*	*2.00*		*24.4*	
64712	Black Soil Special	Irvington Hdw. and Impl. Co., Irvington	12.60	0.85	13.45	3.56		29.9	64712
			12.00	*1.00*	*13.00*	*4.00*		*30.4*	
63477	Big Ben								63477
			10.00	*1.00*	*11.00*	*10.00*		*45.4*	

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number.	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	PHOSPHORIC ACID Available	PHOSPHORIC ACID Insoluble	PHOSPHORIC ACID Total	POTASH From Muriate	POTASH From Sulphate	Index of Relative Value	Station Number.
	Louisville Fertilizer Co.								
64382	Superior Tobacco Grower	D. E. Patterson, Hodgenville	12.00	0.70	12.70	1.72	2.85	32.0	64382
			10.00	*1.00*	*11.00*		*5.00*	*30 4*	
63492	Potash Mixture	Manufacturer	10.80	2.35	13.15	2.23		32.3	63492
			10.00	*1.00*	*11.00*	*2.00*		*21.4*	
64722	Wheat Grower	Copple Bros., Guthrie	10.00	2.10	12.10	4.80		30.2	64722
			10.00	*1.00*	*11.00*	*5.00*		*30.4*	
	Morris & Co., Chicago, Ill.								
64832	Morris Big Five	Manufacturer	10.40	0.75	11.15	1.12	4.91	34.0	64832
			10.00	*1.00*	*11.00*		*4.00*	*27.4*	
	Mt. Pleasant Fert. Co., Inc., Mt. Pleasant, Tenn.								
64405	Mt. Pleasant Superior Tobacco Grower	Mrs. Myrtle Scruggs, Adairville	10.15	4.60	14.75	3.87		28.7	64405
			8.00	*2.00*	*10.00*		*4.00*	*24.8*	
64529	Mt. Pleasant Bone and Potash	Manufacturer	11.10	12.30	23.40	3.44		31.9	64529
			10.00	*4.00*	*14.00*		*3.00*	*25.6*	
64726	Black Patch Wheat and Clover	Farmers' Union Supply Co, Franklin	11.50	12.30	23.80	1.94		28.1	64726
			10.00	*4.00*	*14.00*		*2.00*	*22.6*	

64553	Mt. Pleasant 10-0-5	Manufacturer	10.55	9.75	20.30	5.65		36.7	64553
			10.00	*2.00*	*12.00*		*5.00*	*30.8*	
	Price Chemical Co., Inc., Louisville, Ky.								
64421	Potash Tobacco Fertilizer	E. L. Cox, Cub Run	10.80	0.70	11.50	5.16		31.9	64421
			10.00	*2.00*	*12.00*		*5.00*	*30.8*	
63963	Phosphate and Potash	Manufacturer	11.40	0.50	11.90	0.54	2.09	25.2	63963
			10.00	*2.00*	*12.00*		*2.00*	*21.8*	
	Rasin-Monumental Co., (Sub. of Va.-Car. Chem. Co., Inc., Cincinnati, O.								
63909	Rasin's 10-4 Acid and Potash	Manufacturer	12.40	0.70	13.10	0.72	4.05	33.2	63909
			10.00	*1.50*	*11.50*	*4.00*		*27.6*	
63910	Rasins' Royal Grain Grower								63910
			12.00	*1.50*	*13.50*	*2.00*		*24.6*	
	Read Phosphate Co., Nashville, Tenn.								
64741	Alkaline Bone	J. H. Jasper, Somerset	12.60	7.70	20.30	1.66	0.42	28.3	64741
			10.00	*8.00*	*18.00*	*2.00*		*24.2*	
63253	High Grade Potash Mixture	Manufacturer	12.45	3.05	15.50	3.57		30.6	63253
			10.00	*7.00*	*17.00*	*4.00*		*29.8*	
	Swift and Co., National Stock Yards, Ill.								
63931	Swift's 12-4 Phosphate and Potash	Manufacturer	13.70	2.90	16.60	4.05		33.9	63931
			12.00			*4.00*		*30.0*	
63932	Swift's 14-2 Phosphate and Potash	Manufacturer	15.40	3.10	18.50	1.81		29.8	63932
			14.00			*2.00*		*27.0*	

TABLE IV.—ACID PHOSPHATES WITH POTASH.

Station Number.	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	PHOSPHORIC ACID			POTASH		Index of Relative Value	Station Number.
			Available	Insoluble	Total	From Muriate	From Sulphate		
	Tennessee Chemical Co., (Armour owned). Lou., Ky., Cin., O., Nash., Tenn.								
64482	Ox Big Ben	J. M. Johnson, Benton......	9.25	2.15	11.70	6.47		34.2	64482
			10.00	*1.00*	*11.00*	*10.00*		*45.4*	
63546	Ox Phosphate and Potash	Manufacturer	12.50	2.05	14.55	2.18		26.1	63546
			12.00	*1.00*	*13.00*	*2.00*		*24.4*	
63547	Ox Potash Formula	Manufacturer	12.70	1.50	14.20	4.89		34.3	63547
			12.00	*1.00*	*13.00*	*4.00*		*30.4*	
63549	Ox Superior Tobacco Grower	Manufacturer	10.45	1.90	12.35		4.87	31.1	63549
			10.00	*1.00*	*11.00*		*5.00*	*30.4*	
63561	Ox Potash Mixture	Manufacturer	10.80	2.35	13.15	2.23		32.3	63561
			10.00	*1.00*	*11.00*	*2.00*		*21.4*	
64762	Ox Wheat Grower	G. W. Collins, Glen's Fork..	10.70	1.80	12.50	4.24		29.5	64762
64763		R. E. Moore, Madisonville..	12.20	1.20	13.40	4.25		31.5	64763
			10.00	*1.00*	*11.00*	*5.00*		*30.4*	
	Victor Guano Co., Nashville, Tenn.								
63290	Bone and Potash	Manufacturer	11.90	4.60	16 50	2.39		26.9	63290
			10.00	*8.00*	*18.00*	*2.00*		*24.2*	
63291	High Grade Bone and Potash	Manufacturer	12.45	3.05	15.50	3.57		30.6	63291
			10.00	*7.00*	*17.00*	*4.00*		*29.8*	

	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.								
64769	V-C Acid and Potash King	A. W. Tarter, Columbia.....	10.00	8.10	18.10	3.22		27.9	64769
			10.00	*1.50*	*11.50*	*4.00*		*27.6*	
63885	V-C Prolific Grain Grower								63885
			12.00	*1.50*	*13.50*	*2.00*		*24.6*	
	Wood, Stubbs and Co., Inc., Louisville, Ky.								
64003	Acme Crop Booster	Manufacturer	10.55	0.65	11.20	1.20	5.45	36.0	64003
			10.00	*2.00*	*12.00*		*5.00*	*30.8*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	A. D. Adair and McCarty Bros., Inc., Atlanta, Ga., Chattanooga, Tenn.	
63835	Adair's Ammoniated Phosphate No. 1220	Manufacturer ....
	The American Agr. Cmemical Co., Inc., Cincinnati, O.	
64092 64093	A. A. C. Special Tobacco Grower	Bokhara Seed Co., Falmouth......... H. T. Simpson, Caneyville..........
64098	A. A. C. Little Wonder Fertilizer	Sam Terry, Big Clifty............
63304	Bowker's 1-10 Am. Acid Phosphate	Manufacturer ....
63305	Bowker's 2-10 Am. Acid Phosphate	Manufacturer ....
63307	Bowker's 2-12 Am. Acid Phosphate	Manufacturer ....
63324	Bradley's 1-10 Am. Acid Phosphate	Manufacturer ....
63325	Bradley's 2-10 Am. Acid Phosphate	Manufacturer ....
63326	Bradley's 2-12 Am. Acid Phosphate	Manufacturer ....
63341	Cleveland Dryer Works 1-10 Am. Acid Phos.	Manufacturer ....
63342	Cleveland Dryer Works 2-10 Am. Acid Phos.	Manufacturer ....
63343	Cleveland Dryer Works, 2-12 Am. Acid Phos.	Manufacturer ....
64122	Michigan Carbon Works 1-10 Am. Acid Phos.	Stevens and Applegate, Epworth.....
63359	Michigan Carbon Works 2-10 Am. Acid Phos.	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
11.70	1.25	12.95	0.98		1.46	2.44	2.96	32.7	63835
12.00						*1.65*	*2.00*	*27.9*	
11.00	1.50	12.50		0.67	1.19	1.86	2.26	28.3	64092
11.90	1.20	13.10		0.94	0.88	1.82	2.21	29.3	64093
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
10.75	1.50	12.25		0.28	0.65	0.93	1.13	22.3	64098
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*21.5*	
10.95	1.55	12.50		0.22	0.74	0.96	1.17	22.8	63304
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*21.5*	
10.80	1.85	12.65		0.95	0.98	1.93	2.34	27.3	63305
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
13.80	1.20	15.00		0.87	0.89	1.76	2.14	31.7	63307
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
10.95	1.55	12.50		0.22	0.74	0.96	1.17	22.8	63324
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*21.5*	
10.80	1.85	12.65		0.95	0.98	1.93	2.34	27.3	63325
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
13.80	1.20	15.00		0.87	0.89	1.76	2.14	31.7	63326
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
10.95	1.55	12.50		0.22	0.74	0.96	1.17	22.8	63341
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*21.5*	
10.80	1.85	12.65		0.95	0.98	1.93	2.34	27.3	63342
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
13.80	1.20	15.00		0.87	0.89	1.76	2.14	31.7	63343
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
11.80	0.75	12.55				0.91	1.10	23.5	64122
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*21.5*	
10.80	1.85	12.65		0.95	0.98	1.93	2.34	27.3	63359
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The American Agricultural Chem. Co., Inc., Cincinnati, O.	
63360	Michigan Carbon Works 2-12 Am. Acid Phos.	Manufacturer ....
63377	N. W. Horseshoe Br. 1-10 Am. Acid Phos.	Manufacturer ....
63378	N. W. Horseshoe Br. 2-10 Am. Acid Phos.	Manufacturer ....
63379	N. W. Horseshoe Br. 2-12 Am. Acid Phos.	Manufacturer ....
63396	Packers Boars Head Br. 1-10 Am. Acid Phos.	Manufacturer ....
63397	Packers Boars Head Br. 2-10 Am. Acid Phos.	Manufacturer ....
63398	Packers' Boars Head Br. 2-12 Am. Acid Phos.	Manufacturer ....
	Armour Fertilizer Works, Lou., Ky., Cin., O., Nash., Tenn.	
64155 64620	Armour's Tankage and Phosphate	W. S. Overstreet, LaGrange.......... Lebanon Carriage and Impl. Co., Lebanon ....
63501	Armour's Grain and Grass Grower	Manufacturer ....
63506	Armour's Big Crop Vegetable Grower	Manufacturer ....
64171 64625 64782	Armour's Big Crop Bone Meal and Acid Phosphate	Lebanon Carriage and Impl. Co., Lebanon .... Thurman and Enlow, Hodgenville.... Merrifield and Humphrey, Bloomfield.

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
13.80	1.20	15.00		0.87	0.89	1.76	2.14	31.7	63360
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
10.95	1.55	12.50		0.22	0.74	0.96	1.17	22.8	63377
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*21.5*	
10.80	1.85	12.65		0.95	0.98	1.93	2.34	27.3	63378
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
13.80	1.20	15.00		0.87	0.89	1.76	2.14	31.7	63379
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
10.95	1.55	12.50		0.22	0.74	0.96	1.17	22.8	63396
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*21.5*	
10.80	1.85	12.65		0.95	0.98	1.93	2.34	27.3	63397
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
13.80	1.20	15.00		0.87	0.89	1.76	2.14	31.7	63398
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
12.25	0.45	12.70				0.81	0.98	23.4	64155
12.45	2.90	15.35		0.24	0.45	0.69	0.84	24.0	64620
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*23.3*	
12.50	2.60	15.10				1.80	2.19	30.6	63501
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*28.3*	
9.85	1.55	11.40	1.75		0.48	2.23	2.71	28.8	63506
10.00	*1.00*	*11.00*				*3.29*	*4.00*	*35.1*	
14.05	7.35	21.40				1.05	1.27	30.3	64171
14.05	8.65	22.70				0.94	1.14	30.2	64625
14.80	5.90	20.70				1.21	1.47	31.8	64782
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Armour Fertilizer Works	
63531	Ideal Corn Grower	Manufacturer ....
	Buhner Fertilizer Co., Seymour, Ind.	
64515	Buhner's 4-10	Manufacturer ....
	Calumet Fertilizer Co., New Albany, Ind.	
63767	Calumet Br. Extra Am. Bone Phosphate	
64025	Calumet Br. Potato and Tobacco Grower	
	The Cincinnati Phosphate Co. (owned and operated by Armour Fert. Works), Cin., O.	
63609	Clay Soil Special	Manufacturer ....
63610	"Bonus" A Humus Phosphate	Manufacturer ....
63614	Bone Meal and Acid Phosphate	Manufacturer ....
	Consolidated Chemical Co., Louisville, Ky.	
63983	Camel Brand High Gr. Tobacco Bed Special	Manufacturer ....
63984	Camel Brand Potato and Tobacco Fertilizer	Manufacturer ....
63985	Camel Brand High Grade Fertilizer	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN						
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total	Equivalent to Ammonia	Index of Relative Value	Station Number.
10.20	2.25	12.45		1.32	0.59	1.91	2.32	27.7	63531
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*25.3*	
10.65	1.60	12.25		1.67	1.57	3.24	3.93	36.1	64515
10.00						*3.29*	*4.00*	*34.7*	
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	63767
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*31.4*	64025
14.00	1.45	15.45		1.31	0.48	1.79	2.17	32.3	63609
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*28.3*	
13.30	2.10	15.40		0.34	0.47	0.81	0.98	25.7	63610
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*23.3*	
10.35	10.40	20.75				0.90	1.09	25.1	63614
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
11.70	1.70	13.40	3.22		0.90	4.12	5.00	43.0	63983
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*36.3*	
12.40	1.50	13.90	3.02		0.78	3.80	4.61	42.0	63984
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*36.3*	
12.30	2.00	14.30	1.18		0.81	1.99	2.42	31.2	63985
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Consolidated Chemical Co., Louisville, Ky.	
63986	Camel Brand Corn, Wheat and Oats Grower	Manufacturer ....
63987	Camel Brand No. 1 Fertilizer	Manufacturer ....
	Duncan and Sherley, LaGrange, Ky.	
64210 64789	Tiger Brand Phosphate and Tankage	Manufacturer's warehouse .... Manufacturer's warehouse ....
64078	Tiger Brand Potato Grower	Manufacturer ....
64573 64791	Tiger Brand Corn and Wheat Grower	Manufacturer's warehouse .... Manufacturer's warehouse ....
	The Empire Guano Co., Nashville, Tenn.	
64214	Climax Formula	Darnell Hardware Co., Russell Springs
64525	Half and Half Raw Bone Meal and Acid Phosphate	Manufacturer ....
	The Evansville Packing Co., Evansville, Ind.	
63447	Ammoniated Phosphate	Manufacturer ....
63449	Corn and Wheat Grower	Manufacturer ....
63453	Wonder Growth	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
16.70	1.20	17.90				0.59	0.72	29.1	63986
14.00	*4.00*	*18.00*				*0.41*	*0.50*	*25.1*	
14.00	1.50	15.50				0.55	0.67	24.9	63987
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.1*	
13.20	1.30	14.50		0.27	0.49	0.76	0.92	24.9	64210
11.70	2.80	14.50				0.94	1.14	24.3	64789
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*23.7*	
11.95	3.50	15.45				3.46	4.20	40.1	64078
10.00	*2.00*	*12.00*				*3.29*	*4.00*	*35.5*	
10.95	1.25	12.20				0.46	0.56	19.7	64573
12.60	1.80	14.40				0.47	0.57	22.4	64791
10.00	*4.00*	*14.00*				*0.41*	*0.50*	*19.1*	
13.45	3.80	17.25				0.52	0.63	24.8	64214
12.00	*7.00*	*19.00*				*0.41*	*0.50*	*23.3*	
13.60	8.30	21.90				1.96	2.38	35.5	64525
10.00	*10.00*	*20.00*				*1.85*	*2.25*	*30.1*	
17.60	0.25	17.85		0.55	0.40	0.95	1.15	32.2	63447
12.00						*0.41*	*0.50*	*20.5*	
16.35	0.15	16.50		1.66	0.52	2.18	2.65	37.7	63449
10.00						*0.82*	*1.00*	*19.9*	
15.30	0.10	15.40		2.46	0.49	2.95	3.58	40.7	63453
10.00						*1.65*	*2.00*	*24.9*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co., Inc., Louisville, Ky.	
63677	Red Rooster Mixture	Manufacturer ....
63678	Daybreak Nitro Phosphate	Manufacturer ....
63679	Daybreak Harvest Home	Manufacturer ....
63680	Royal Meal Mixture	Manufacturer ....
63681	Daybreak Double-Duty Corn and Wheat Grower	Manufacturer ....
63682	Daybreak Half and Half Meal Mixture	Manufacturer ....
63702	A-1 Fertilizer	Manufacturer ....
64250 64651	A-1 Corn and Wheat Fertilizer	T. G. Moren, London .... L. R. Hart, Big Clifty ....
63704	A-1 Formula	Manufacturer ....
63705	High Grade Fertilizer	Manufacturer ....
63706	A-1 Soluble Vegetable Manure	Manufacturer ....
63707	A-1 Potato Grower	Manufacturer ....
64251 64577	A-1 Extra Tobacco Special	J. A. Shaver, Greenville .... St. Matthews Produce Exchange, St. Matthews ....
63709	Liberty Grain Grower	Manufacturer ....
63710	Standard Meal Mixture	Manufacturer ....
64252	Liberty Potato Grower	Bob Humphrey, Central City ....
63732	1st Prize Phosphate Mixture	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
15.00	5.70	20.70		0.83		0.83	1.01	29.8	63677
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.1*	
17.90	1.10	19.00		0.75		0.75	0.91	31.8	63678
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*26.6*	
13.30	5.90	19.20		2.61	0.26	2.87	3.48	39.5	63679
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*31.8*	
12.60	8.60	21.20		0.97	0.24	1.21	1.47	29.6	63680
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
12.60	8.60	21.20		0.97	0.24	1.21	1.47	29.6	63681
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
11.15	9.95	21.10		1.74	0.26	2.00	2.43	32.7	63682
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*28.9*	
14.50	5.20	19.70		1.12	0.22	1.34	1.63	31.9	63702
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*24.5*	
15.00	0.70	15.70		0.45	0.36	0.81	0.98	27.6	64250
15.50	0.85	16.35		0.55	0.45	1.00	1.21	29.6	64651
14.00	*4.00*	*18.00*				*0.82*	*1.00*	*27.5*	
11.65	9.75	21.40		1.74	0.29	2.03	2.46	33.6	63704
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
14.40	3.70	18.10		2.13	0.23	2.36	2.87	37.2	63705
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
14.40	3.70	18.10		2.13	0.23	2.36	2.87	37.2	63706
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*29.5*	
13.20	3.60	16.80		4.13		4.13	5.01	46.0	63707
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*36.3*	
11.00	9.40	20.40		0.66	2.46	3.12	3.79	39.0	64251
10.35	0.95	11.30		0.86	2.43	3.29	4.00	35.7	64577
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*36.3*	
12.85	9.20	22.05		0.81		0.81	0.98	27.8	63709
10.00	*10.00*	*20.00*				*0.41*	*0.50*	*21.5*	
12.60	8.60	21.20		0.97	0.24	1.21	1.47	29.6	63710
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
11.55	0.25	11.80		0.63	1.02	1.65	2.00	29.4	64252
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*28.9*	
15.00	5.70	20.70		0.83		0.83	1.01	29.8	63732
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.1*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Federal Chemical Co., Inc., Louisville, Ky.	
63733	1st Prize Ammoniated Bone Phosphate	Manufacturer
63734	Mogul Corn and Wheat Fertilzer	Manufacturer
63735	1st Prize Ammoniated Meal Mixture	Manufacturer
63736	Sweepstakes Corn and Wheat Grower	Manufacturer
63737	Blue Ribbon Meal Mixture	Manufacturer
	Fox Chem. Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.	
63787	Red Fox Mixture	Manufacturer
63788	Fox Ammoniated Phosphate	Manufacturer
63789	Fox Ammoniated Fertilizer	Manufacturer
63790	Fox Double-Quick Corn and Wheat Grower	Manufacturer
63791	Fox Half and Half Meal Mixture	Manufacturer
	Globe Fert. Co., Br. Fed. Chem. Co., Inc., Louisville, Ky.	
64666	Globe Gold Medal Mixture	I. K. Miller & Sons, Campbellsville
63819	Globe Grain-O-Phosphate	Manufacturer
63820	Globe Golden Harvest	Manufacturer
63821	Globe Double Value Corn and Wheat Grower	Manufacturer
63822	Globe Half and Half Meal Mixture	Manufacturer

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
17.90	1.10	19.00		0.75		0.75	0.91	31.8	63733
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*26.6*	
14.50	5.20	19.70		1.12	0.22	1.34	1.63	31.9	63734
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*24.5*	
13.30	5.90	19.20		2.61	0.26	2.87	3.48	39.5	63735
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*31.8*	
12.60	8.60	21.20		0.97	0.24	1.21	1.47	29.6	63736
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
11.15	9.95	21.10		1.74	0.26	2.00	2.43	32.7	63737
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*28.9*	
15.00	5.70	20.70		0.83		0.83	1.01	29.8	63787
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.1*	
17.90	1.10	19.00		0.75		0.75	0.91	31.8	63788
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*26.6*	
13.30	5.90	19.20		2.61	0.26	2.87	3.48	39.5	63789
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*31.8*	
12.60	8.60	21.20		0 97	0.24	1.21	1.47	29.6	63790
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
11.15	9.95	21.10		1.74	0.26	2.00	2.43	32.7	63791
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*28.9*	
13.35	1.65	15.00				0.59	0.72	24.2	64666
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.1*	
17.90	1.10	19.00		0.75		0.75	0.91	31.8	63819
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*26.6*	
13.30	5.90	19.20		2.61	0.26	2.87	3.48	39.5	63820
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*31.8*	
12.60	8.60	21.20		0.97	0.24	1.21	1.47	29.6	63821
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
11.15	9.95	21.10		1.74	0.26	2.00	2.43	32.7	63822
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*28.9*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Groves Fertilizer Works, Cincinnati, Ohio	
64011	Grain Grower	Manufacturer
64302	Ammoniated Phosphate	J. C. Bowles, Jeffersontown
64308	Perfect Driller	Aaron Moore, Leitchfield
64309		S. V. Kissee, Somerset
64674		T. Z. Leachman, Greensburg
64675		Aaron Moore, Leitchfield
64310	Bone and Phosphate (Bone Mixture)	I. K. Miller & Sons, Campbellsville
64020	Special Bone Mixture (Bone Mixture)	Manufacturer
	Hall Seed Co., Louisville, Ky.	
63567	Halco Corn and Wheat Grower	Manufacturer
63568	Halco Potato Grower	Manufacturer
63569	Halco Vegetable Grower	Manufacturer
63572	Halco Half Bone and Phosphate	Manufacturer
	Hopkins Fertilizer Co., New Albany, Ind.	
63863	Tankage and Phosphate Special	Manufacturer
63864	Favorite	Manufacturer
64314	Ammoniated Special	Duncan & Sherley, LaGrange
	International Agricultural Corporation, Inc., Cincinnati, O.	
63418	I. A. C. Potato and Truck Grower	Manufacturer

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
12.50	0.80	13.30		0.49	0.39	0.88	1.07	24.4	64011
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*23.3*	
13.70	1.50	15.20		0.80	0.74	1.54	1.87	30.4	64302
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*28.3*	
12.25	5.90	18.15				0.44	0.53	23.4	64308
11.30	6.50	17.80				0.33	0.40	21.5	64309
9.45	7.15	16.60				0.40	0.49	19.4	64674
7.20	6.75	13.95				0.43	0.52	16.1	64675
8.00	*8.00*	*16.00*				*0.41*	*0.50*	*17.7*	
13.70	7.70	21.40				0.90	1.09	26.3	64310
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
12.90	2.95	15.85		0.87	0.83	1.70	2.06	30.7	64020
8.00	*8.00*	*16.00*				*1.65*	*2.00*	*25.1*	
10.40	1.75	12.15		0.66	0.32	0.98	1.19	22.2	63567
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*20.3*	
10.20	2.25	12.45		1.32	0.59	1.91	2.32	27.7	63568
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*25.3*	
9.85	1.55	11.40	1.75		0.48	2.23	2.71	28.8	63569
10.00	*1.00*	*11.00*				*3.29*	*4.00*	*35.1*	
14.00	7.35	21.35				0.81	0.98	28.8	63572
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
13.55	0.95	14.50		0.59	0.21	0.80	0.97	25.5	63863
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*23.7*	
13.05	0.55	13.60		1.64	0.92	2.56	3.11	35.2	63864
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*28.7*	
14.30	1.70	16.00		1.31	2.02	3.33	4.04	42.1	64314
10.00	*2.00*	*12.00*				*3.29*	*4.00*	*35.5*	
10.65	2.15	12.80	1.17	0.49	1.72	3.38	4.10	37.1	63418
10.00	*5.00*	*15.00*				*3.29*	*4.00*	*36.7*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	International Agri. Corporation	
63419	I. A. C. High Grade Special	Manufacturer ....
63420	I. A. C. Corn and Grain Grower	Manufacturer ....
63421	I. A. C. Farmers' Best Friend	Manufacturer ....
63437	Buffalo H. Gr. Plant Food	Manufacturer ....
63438	Buffalo Ammoniated Phosphate	Manufacturer ....
63439	Buffalo Grain Grower	Manufacturer ....
	The Jarecki Chem. Co. (Armour owned), Cincinnati, O.	
63584	Clay Soil Special	Manufacturer ....
63585	Ammoniated Phosphate	Manufacturer ....
63589	Bone Meal and Acid Phosphate	Manufacturer ....
	The Kaufman Fert. Co. (owned and operated by Armour Fert. Wks.), Cincinnati, O.	
63632	Clay Soil Special	Manufacturer ....
63633	Ammoniated Phosphate	Manufacturer ....
63637	Bone Meal and Acid Phosphate	Manufacturer ....
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
63848	O. K. Mixture	Manufacturer ....
63849	O. K. Ammoniated Phosphate	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
10.15	5.10	15.25	0.83	0.59	1.37	2.79	3.39	34.0	63419
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*31.8*	
13.15	3.90	17.05	0.67	0.32	0.86	1.85	2.25	32.4	63420
12.00	*5.00*	*17.00*				*1.65*	*2.00*	*29.9*	
13.15	4.80	17.95				0.91	1.10	27.1	63421
13.00	*5.00*	*18.00*				*0.82*	*1.00*	*26.4*	
10.15	5.10	15.25	0.83	0.59	1.37	2.79	3.39	34.0	63437
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*31.8*	
13.15	3.90	17.05	0.67	0.32	0.86	1.85	2.25	32.4	63438
12.00	*5.00*	*17.00*				*1.65*	*2.00*	*29.9*	
13.15	4.80	17.95				0.91	1.10	27.1	63439
13.00	*5.00*	*18.00*				*0.82*	*1.00*	*26.4*	
14.00	1.45	15.45		1.31	0.48	1.79	2.17	32.3	63584
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*28.3*	
13.30	2.10	15.40		0.34	0.47	0.81	0.98	25.7	63585
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*23.3*	
10.35	10.40	20.75				0.90	1.09	25.1	63589
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
14.00	1.45	15.45		1.31	0.48	1.79	2.17	32.3	63632
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*28.3*	
13.30	2.10	15.40		0.34	0.47	0.81	0.98	25.7	63633
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*23.3*	
10.35	10.40	20.75				0.90	1.09	25.1	63637
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
15.00	5.70	20.70		0.83		0.83	1.01	29.8	63848
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.1*	
17.90	1.10	19.00		0.75		0.75	0.91	31.8	63849
15.00	*4.00*	*19.00*				*0.41*	*0.50*	*26.6*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Kentucky Fertilizer Co.	
63850	O. K. Special Meal Mixture	Manufacturer ....
63851	O. K. Double-Header Corn and Wheat Grower	Manufacturer ....
63852	O. K. Half and Half Meal Mixture	Manufacturer ....
	Louisville Fert. Co. (Armour owned), Louisville, Ky.; Cincinnati, O.; Nashville, Tenn.	
63466	Tankage and Phosphate	Manufacturer ....
63467	Clay Soil Special	Manufacturer ....
63474	Big Vegetable Grower	Manufacturer ....
64715	Bone Meal and Acid Phosphate	Hurst Brown Hardware Co., Bardstown
64399	4-12 Fertilizer	Humlong & Wheat, Germantown ....
	Morris & Co., Chicago, Ill.	
64831	Morris Big Four	Manufacturer ....
64837	Morris Big Eleven	Manufacturer ....
64838	Morris Big Twelve	Manufacturer ....
	Mt. Pleasant Fertilizer Co., Inc., Mt. Pleasant, Tenn.	
63655	Mt. Pleasant Grain Grower	Manufacturer ....
63656	Mt. Pleasant Corn Special	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
13.30	5.90	19.20		2.61	0.26	2.87	3.48	39.5	63850
10.00	*5.00*	*15.00*				*2.47*	*3.00*	*31.8*	
12.60	8.60	21.20		0.97	0.24	1.21	1.47	29.6	63851
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
11.15	*9.95*	*21.10*		1.74	0.26	2.00	2.43	32.7	63852
10.00	*10.00*	*20.00*				*1.65*	*2.00*	*28.9*	
11.80	*3.00*	14.80	0.57		0.48	1.05	1.27	25.2	63466
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*23.3*	
12.50	2.60	15.10				1.80	2.19	30.6	63467
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*28.3*	
9.85	1.55	11.40	1.75		0.48	2.23	2.71	28.8	63474
10.00	*1.00*	*11.00*				*3.29*	*4.00*	*35.1*	
13.80	7.55	21.35				1.30	1.58	31.5	64715
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
14.15	0.80	14.95		2.33	0.75	3.08	3.74	40.0	64399
12.00	*1.00*	*13.00*				*3.29*	*4.00*	*38.1*	
12.55	6.55	19.10				1.15	1.40	28.4	64831
13.00	*5.00*	*18.00*				*0.82*	*1.00*	*26.4*	
11.30	2.30	13.60				1.99	2.42	29.8	64837
10.00	*1.50*	*11.50*				*0.82*	*1.00*	*20.5*	
12.60	2.90	15.50				2.19	2.66	33.2	64838
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*28.5*	
11.25	9.55	20.80		0.67	0.62	1.29	1.57	28.4	63655
8.00	*2.00*	*10.00*				*1.23*	*1.50*	*20.2*	
13.30	5.00	18.30				0.81	0.98	26.8	63656
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*23.7*	

TABLE V.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Mt. Pleasant Fertilizer Co.	
63657	Black Patch Universal	Manufacturer ....
63661	Mt. Pleasant Burley Tobacco Grower	Manufacturer ....
64048	Mt. Pleasant 10-4-0	
	Price Chem. Co., Inc., Louisville, Ky.	
63957	H. Gr. Tobacco Bed Special	Manufacturer ....
63958	Potato and Tobacco Fertilizer	Manufacturer ....
64420	H. Gr. Fertilizer	Peoples Store, Loretto ....
63960	Victory Grain Special	Manufacturer ....
63961	No. 1 Fertilizer	Manufacturer ....
	Rasin Monumental Co. (Sub. of Va.-Car. Chem. Co., Inc.), Cincinnati, O.	
63911	Rasin's Fenhumus Fertilizer	Manufacturer ....
63912	Rasin's Grain Fertilizer	Manufacturer ....
64427	Rasin's Special Plant Food	J. H. Wyan, London ....
64736		J. H. Wyan, London ....
64428	Rasin's Truck and Tobacco Fertilizer	Martin-Hodgkin Supply Co., Winchester ....
63922	Rasin's Phosphate and Bone Meal	Manufacturer ....

ACID PHOSPHATES WITH NITROGEN.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
11.75	7.65	19.40		1.08	0.62	1.70	2.06	30.9	63657
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*25.7*	
12.95	4.80	17.75		1.10	0.50	1.60	1.94	31.0	63661
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*28.7*	
									64048
10.00	*8.00*	*18.00*				*3.29*	*4.00*	*37.9*	
11.70	1.70	13.40	3.22		0.90	4.12	5.00	43.0	63957
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*36.3*	
12.40	1.50	13.90	3.02		0 78	3.80	4.61	42.0	63958
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*36.3*	
13.35	1.95	15.30	1.08		0.72	1.80	2.19	31.6	64420
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*26.5*	
16.70	1.20	17.90				0.59	0.72	29.1	63960
14.00	*4.00*	*18.00*				*0.41*	*0.50*	*25.1*	
14.00	1.50	15.50				0.55	0.67	24.9	63961
12.00	*4.00*	*16.00*				*0.41*	*0.50*	*22.1*	
14.80	1.80	16.60				0.71	0.86	27.2	63911
12.00	*1.50*	*13.50*				*0.41*	*0.50*	*21.1*	
17.10	1.50	18.60				1.15	1.40	33.2	63912
13.00	*1.50*	*14.50*				*0.82*	*1.00*	*25.0*	
12.50	1.20	13.70		0.93	0.74	1.67	2.03	29.3	64427
12.70	1.70	14.40				1.61	1.95	29.4	64736
11.00	*1.50*	*12.50*				*1.65*	*2.00*	*27.0*	
10.95	0.45	11.40	1.24	1.21	0.54	2.99	3.63	34.6	64428
9.00	*1.50*	*10.50*				*2.47*	*3.00*	*28.9*	
11.20	12.60	23.80				1.03	1.25	28.0	63922
10.00	*12.00*	*22.00*				*0.82*	*1.00*	*24.7*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Read Phosphate Co., Nashville, Tenn.	
64434	Standard Grain Grower	W. L. Calhoun, Montpelier
64435		I. K. Miller & Sons, Campbellsville
63264	Red Diamond Favorite	Manufacturer
64526	Half and Half Raw Bone Meal and Acid Phosphate	Manufacturer
	St. Matthews Produce Exchange, Inc., St. Matthews, Ky.	
64805	Exchange Special	Manufacturer's Warehouse
64806		Manufacturer's Warehouse
	The Smith Agricultural Chem. Co., Columbus, O.	
64032	Smith's Wheat Maker and Seeding Down	Manufacturer
	Swift & Co., National Stock Yards, Ill.	
63930	Swift's Blood and Phosphate	Manufacturer
63937	Swift's Corn and Oats Special	Manufacturer
64469	Swift's Tankage and Bone Phosphate	E. M. Ford & Sons, Cave City
64470		W. S. Overstreet, LaGrange
64751		H. C. McClure, Somerset
64807		W. S. Overstreet, LaGrange
64473	Swift's Bone Meal and Phosphate Fertilizer	Mayhew & Gilbert, Franklin
64474		J. W. Collier, Crab Orchard
64753		Mayhew & Gilbert, Franklin
64809		W. S. Overstreet, LaGrange

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
14.60	2.90	17.50				0.52	0.63	26.2	64434
12.65	3.75	16.40				0.63	0.76	24.3	64435
12.00	*7.00*	*19.00*				*0.41*	*0.50*	*23.3*	
14.20	3.30	17.50	0.48		1.82	2.30	2.79	36.4	63264
12.00	*3.00*	*15.00*				*1.65*	*2.00*	*29.1*	
13.60	8.30	21.90				1.96	2.38	35.5	64526
10.00	*10.00*	*20.00*				*1.85*	*2.25*	*30.1*	
13.40	4.00	17.40	1.36	0.21	1.64	3.21	3.90	41.0	64805
14.80	3.50	18.30	0.56		1.20	1.76	2.14	34.2	64806
8.00						*0.82*	*1.00*	*16.9*	
12.70	1.10	13.80				0.41	0.50	22.0	64032
12.00						*0.41*	*0.50*	*20.5*	
13.40	3.10	16.50		1.05	0.79	1.84	2.23	32.4	63930
12.00	*3.00*	*15.00*				*1.65*	*2.00*	*29.1*	
11.10	3.40	14.50		1.17	0.76	1.93	2.34	29.6	63937
10.00	*3.00*	*13.00*				*1.65*	*2.00*	*26.1*	
13.70	2.70	16.40		0.49	0.39	0.88	1.07	26.9	64469
10.55	2.40	12.95	0.32	0.66	0.31	1.29	1.57	24.5	64470
13.40	3.00	16.40		0.37	0.62	0.99	1.20	27.2	64751
13.70	2.00	15.70		0.20	0.53	0.73	0.89	25.7	64807
12.00	*3.00*	*15.00*				*0.82*	*1.00*	*24.1*	
15.75	5.50	21.25				0.84	1.02	30.9	64473
15.75	5.50	21.25				0.72	0.87	30.2	64474
15.80	5.70	21.50				0.87	1.06	31.2	64753
16.50	5.80	22.30				1.00	1.21	33.1	64809
13.00	*7.00*	*20.00*				*0.82*	*1.00*	*27.2*	

TABLE V.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Taylor & Powell Fertilizer Co., Inc., Springfield, Tenn.	
64044	No. 4 Tobacco Grower Without Potash	Manufacturer ....
64052	No. 3 Tobacco Grower	Manufacturer ....
64055	No. 1 Corn Grower	Manufacturer ....
	Tennessee Chemical Co. (Armour owned), Louisville, Ky.; Cincinnati, O.; Nashville, Tenn.	
63537	Ox Harvester	Manufacturer ....
63538	Ox Ammoniated Phosphate	Manufacturer ....
63543	Ox Big Vegetable Grower	Manufacturer ....
63556	Ox Bone Meal and Acid Phosphate	
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O	
64504	V.-C. Richmus Fertilizer	Patrick Dillon, Hardinsburg ....
63887	V.-C. Sure Grain Producer	Manufacturer ....
63888	V.-C. Rescue Fertilizer	Manufacturer ....
63895	V.-C. Tobacco Plant Food	Manufacturer ....
63898	V.-C. Bone Meal and Phosphate	Manufacturer ....
	Wood, Stubbs & Co., Inc., Louisville, Ky.	
64002	Acme High Grade Vegetable Grower	Manufacturer ....

Acid Phosphates with Nitrogen.

PHOSPHORIC ACID			NITROGEN				Equivalent to Ammonia	Index of Relative Value	Station Number.
Available	Insoluble	Total	In Nitrates	In Ammonia Salts	Organic	Total			
8.85	4.85	13.70	3.40	0.60	0.65	4.65	5.65	43.1	64044
10.00						*2.47*	*3.00*	*29.8*	
12.60	8.20	20.80		0.88	1.36	2.24	2.72	35.6	64052
11.00						*1.23*	*1.50*	*23.9*	
11.00	6.90	17.90		1.43	0.45	1.88	2.28	30.5	64055
11.00						*1.23*	*1.50*	*23.9*	
11.80	3.00	14.80	0.57		0.48	1.05	1.27	25.2	63537
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*23.3*	
12.50	2.60	15.10				1.80	2.19	30.6	63538
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*28.3*	
9.85	1.65	11.40	1.75		0.48	2.23	2.71	28.8	63543
10.00	*1.00*	*11.00*				*3.29*	*4.00*	*35.1*	
									63556
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*23.9*	
12.95	1.60	14.55				0.48	0.58	23.0	64504
12.00	*1.50*	*13.50*				*0.41*	*0.50*	*21.1*	
17.10	1.50	18.60				1.15	1.40	33.2	63887
13.00	*1.50*	*14.50*				*0.82*	*1.00*	*25.0*	
12.70	2.70	15.40				2.03	2.46	32.3	63888
11.00	*1.50*	*12.50*				*1.65*	*2.00*	*27.0*	
11.20	1.70	12.90		1.63	1.21	2.84	3.45	34.5	63895
9.00	*1.50*	*10.50*				*2.47*	*3.00*	*28.9*	
10.50	13.10	23.60				0.99	1.20	26.9	63898
10.00	*12.00*	*22.00*				*0.82*	*1.00*	*24.7*	
10.90	1.90	12.80	3.30		0.82	4.12	5.00	41.8	64002
10.00	*4.00*	*14.00*				*3.29*	*4.00*	*36.3*	

TABLE VI.—MATERIALS CONTAINING NITROGEN

Station Number.	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	NITROGEN	Equivalent to Ammonia	Index of Relative Value	Station Number.
	Armour Fertilizer Works, Louisville, Ky.; Cincinnati, O.; Nashville, Tenn.					
63523	Armour's Big Crop Nitrate of Soda	Manufacturer	17.56 *14.81*	21.32 *17.98*	105.4 *88.9*	63523
	Hopkins Fertilizer Co., New Albany, Ind.					
63878	Nitrate of Soda		*15.00*	*18.21*	*90.0*	63878
	Norwegian Nitrogen Products Co., Inc., New York, N. Y.					
64026	Norwegian Nitrate of Lime	Manufacturer	12.28 *13.00*	14.91 *15.78*	73.7 *78.0*	64026
	Tennessee Chem. Co. (Armour owned), Louisville, Ky.; Cincinnati, O.; Nashville, Tenn.					
63563	Ox Nitrate of Soda	Manufacturer	17.56 *14.81*	21.32 *17.98*	105.4 *88.9*	63563
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.					
63902	V.-C. Nitrate of Soda	Manufacturer	15.92 *14.82*	19.33 *18.00*	95.5 *88.9*	63902
63905	V.-C. Sulphate of Ammonia	Manufacturer	20.62 *20.59*	25.04 *25.00*	123.7 *123.5*	63905

TABLE VII.—POTASH SALTS.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained.	Potash From Muriate	Potash From Sulphate	Index of Relative Value	Station Number.
	Hopkins Fertilizer Co., New Albany, Ind.					
63877	Muriate of Potash		*50.00*		*150.0*	63877
	Virginia-Carolina Chem. Co., Inc., Cincinnati, O.					
63903	V.-C. Muriate of Potash	Manufacturer	51.00 *50.00*		153.0 *150.0*	63903
63904	V.-C. Sulphate of Potash	Manufacturer		51.36 *48.00*	154.1 *144.0*	63904

TABLE VIII.—NITROGEN AND POTASH MATERIALS.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	NITROGEN			Equivalent to Ammonia	Potash from Muriate	Index of Relative Value	Station Number.
			In Nitrates	Organic	Total				
	Dosch Chemical Co., Inc., Louisville, Ky.								
64085	Dosch Tobacco Fertilizer	Manufacturer	0.74	1.78	2.52 *2.06*	3.06 *2.50*	3.56 *1.50*	25.8 *16.9*	64085

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